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(For Crops other than Herbage)

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Note.—Initialled abstracts are written by the following :

Mr. G. B. Laurence	G. B. L.
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Mr. L. E. Morris	L. E. M.

* General studies, see also individual crops.

Plant Breeding Abstracts.

Vol. V, No. 2.

Part I. British Empire

CYTOLOGY 576.3

199. KOSHY, T. K. 576.312.3
576.354.4
Chromosome studies in *Allium*. II. The meiotic chromosomes.
J. R. Micr. Soc. 1934 : 54 : 104-20.

Full descriptions are given of the chromosome behaviour in a number of species of *Allium* at meiosis. Just as the chromosomes previously described in mitosis (see "Plant Breeding Abstracts," Vol. IV, Abst. 830), the meiotic chromosomes are invariably double, consisting of two spiral chromonemata, which explains all the appearances ever reported or figured for such chromosomes. Pairing takes place between these double chromosomes starting from the ends and progressing towards the constriction. A four-strand condition is thus established without cleavage, so reducing the chromosome number to the haploid; the remaining behaviour is in nearly every way identical with that in mitosis except for the reduced chromosome number. The author questions whether every point of crossing-over of the threads represents a true chromosomal interchange and gives figures shewing how the appearance of a chiasma may be produced by deep staining in material which with light staining appears very different.

Cleavage is initiated again at prophase of the second maturation division. It seems evident that each coiled thread splits along its axis, giving rise to two interlaced spirals, and no straight threads were observed at any stage, contrary to the reports of certain observers. The chromonemata separate by the untwisting during contraction.

There was no evidence of suppression of cleavage in the premeiotic division and there seems no doubt that pairing takes place between homologues which are already double—which can only be explained by a specific attraction between homologous genes in the chromosome.

BOTANY 581

200. CODD, L. E. W. 581.143.26.03:633.18
Vernalization—a recent development in agricultural research and its application to rice.
Agric. J. Brit. Guiana 1934 : 5 : 212-13.

A reference to the bulletin on vernalization (see "Plant Breeding Abstracts" Vol. III, Abst. 554). Experiments are being made on vernalization of rice.

FIELD TESTS 631.421.

201. PATERSON, D. D. 631.421:519.24
A note on the value of correlation and regression in statistical analysis.
Trop. Agriculture, Trin. 1934 : 11 : 160-69, 220-29.

An extension, on similar practical lines, of the scope of the article reviewed under "Plant Breeding Abstracts," Vol. IV, Abst. 523.

PLANT DISEASES 632

202. SAUNDERS, A. R. 633.15-2.5-1.521.6:575
633.17-2.5-1.521.6:575
Studies in phanerogamic parasitism with particular reference to *Striga lutea* Louv.
Part I. The economic importance, distribution, life history, and parasitism of *Striga lutea*.
Part II. Experiments on the control of the parasite in the field.
Part III. The breeding of resistant host varieties.
Sci. Bull. Dep. Agric. S. Afr. 1933 : No. 128 : Pp. 56.

Part I deals with the economic importance, distribution, life history and parasitism of witchweed, *Striga lutea*, Part II gives experimental data on the control of the parasite in the field

and Part III discusses the breeding of strains of sorghum and maize partially immune to the parasite.

Selections were made of immune plants of Kaffir corn for the production of pure lines and of susceptible strains for comparison. Crosses were made between resistant lines, if possible to increase the resistance and develop desirable agronomic characters and also to determine whether there was linkage between resistance and seed colour or other characters.

Selections were continued into the F_4 . There was no linkage between the factors for resistance and seed colour or other plant characters—but a significant positive correlation between plant height and yield was observed in one cross and types combining high resistance with other desirable qualities occurred. Calculation of the mean resistance ratios in F_3 shewed that the inheritance of resistance is very complex but the data are not sufficient for a detailed genetical analysis. Transgressive segregation in the direction of greater susceptibility was observed in three crosses. There was a partial dominance of susceptibility in two crosses and of resistance in a third with the same female parent in each case.

Three years devoted to the isolation of resistant strains of maize have only slightly diminished the marked susceptibility of all lines.

Teosinte (*Euchlaena mexicana*) proved to be as susceptible as the open pollinated varieties of maize.

ECONOMIC PLANTS 633

203. WATKINS, A. E. 633:575
The practical application of genetical science to plant breeding.
 Rep. and Summary Proc. 2nd Conf. Cott. Grow. Prob., Emp. Cott. Grow.
 Corp. 1934: 14-22.

A brief general review of the results obtained by the application of Mendelian methods is given and deductions as to the potentialities in the near future are drawn. The usual practice is a dual process; the finding of varieties in which useful characters reach their maximum and the combination of these in a single individual. The process was developed before Mendelian times but it can now be used with greater chance of success. The range of variation has also been extended by the creation of new variants by X-rays and the formation of new polyploid forms. So far these scientific principles have only been applied to self-fertilized plants. In the case of crops normally cross-pollinated the matter is more difficult and usually some form of selection is alone possible though hybrid vigour may profitably be exploited.

It is concluded that, in new countries or to meet a change in demand, important results may be obtained in the case of self-fertilized plants but improvement becomes increasingly difficult. Except, probably, in the case of maize, scientific breeding has made no recent advance in cross-fertilized plants except in those which are reproduced vegetatively. H.M.L.

204. PAL, B. P. 633:575(54.1)
Recent progress in plant breeding at Pusa.
 Agric. and Live-st. Ind., 1934: 4: 505-15.

Wheat. The main aim has been to introduce standing power, for which purpose Pusa 4 and Pusa 52 have been crossed with Federation from Australia. Some of the offspring have proved disease resistant and one has been found resistant to five physiologic forms of orange rust. Reference is made to Pusa 111 and Pusa 114 and an account given of the spread of Pusa wheats outside India.

Rice. One autumn and three winter paddies have been selected from 123 distinct types separated out from Bihar and Orissa rices.

Barley. Yield is the main objective and type 21 has been isolated to this end. The genetic behaviour of various characters, particularly the hooded character of Nepal barley, is noted.

Oats. European oats (*A. sativa* L.) have too long a growing period and crosses are being made between these and Indian oats (*A. sterilis* L. var. *culta*).

Linseed. The alluvial type, with shallow roots, has been crossed with the peninsular type with deep roots and bolder seed.

Sesamum. Crosses have been made to produce bushy types with white seed.

Safflower. Crossing technique is difficult but is under way.

Rahar (*Cajanus indicus* Spreng.). The major character of economic importance is disease resistance (to *Fusarium vasinfectum*). Characters for flower colour are linked with seed colour but these are independent of the character disease resistance.

Urid and *Mung* (*Phaseolus mungo* L. and *P. radiatus* L.). Both are separable into two groups distinguished by the root system.

Lentils (*Ervum lens* L.). Hybridization has led to the production of several high yielding types.

Gram (*Cicer arietinum* L.). It has been found impossible to combine high yield with size and light colour in seed but medium yield has been obtained.

Brassica. Difficulty arises from self-sterility. Types have been isolated from the self-fertile species *B. campestris* var. *sarson* Prain, yellow sarson, *B. juncea* Hooker, rai, and *B. rugosa* var. *cuneifolia* Prain, Chinese mustard. The inheritance of seed colour and self-fertility have been studied.

Tobacco. Two types have been isolated from a cross between Pusa Type 28 and Adcock combining leaf quality with the short growing period of the Indian forms.

Chilli. The crop has mainly been used as material for students.

Hemp (*Hibiscus cannabinus* L. and *H. sabdariffa* L.). Crosses have been made between strains of the latter species.

Ganja (*Cannabis sativa* L.). A useful strain, Type I, has been isolated by mass selection.

H. M. L.

205. SHAW, F. J. F. and KASHI RAM.

633:575(54.1)

Improved varieties of crops produced at Pusa.

Agric. and Live-st. Ind., 1934 : 4 : 465-80.

The paper gives a brief account of the types, of which the reputé is established or which are worthy of trial, of the various crop plants studied at Pusa. The main characters of each are noted and, where they are the result of hybridization, the parentage is also given. The more important are :—

Wheat. Pusa 4 together with Pusa 111, a selection from a natural cross or mutation of Pusa 4, and Pusa 80-5, a hybrid between Pusa 4 and Pusa 6; Pusa 12; Pusa 101, a cross between Muzaffarnagar and Pusa 22, and the Pusa nos. 52 and 114.

Oats. These belong to the species *A. sterilis culta* L., B.S. 1 and B.S. 2; Hybrids C and J, being crosses of B.S. 2 and B.S. 4 respectively with Scotch potato oat.

Lentils (*Ervum lens* L.). Type 11 and Hybrid III-86.

Linseed (*Linum usitatissimum* L.). Types 12, 121, 124 and Hybrids 10, 21, 55 and 68.

Tobacco (*Nicotiana tabacum* L.). Types 28 and 63 and Hybrids 142 and 177.

Species from which results have been obtained by selection include barley, paddy (*Oryza sativa* L.), rahar (*Cajanus indicus* Spreng.), gram (*Cicer arietinum* L.), mung (*Phaseolus radiatus* L.), urid (*Phaseolus mungo* L. var. *Roxburghii* Prain), sesamum (*Sesamum indicum* D.C.), safflower (*Carthamus tinctorius* L.), chillies (*Capsicum annuum* L. and *C. frutescens* L.), hemp (*Hibiscus cannabinus* L. and *H. sabdariffa* L.) and tobacco (*Nicotiana rustica* L.).

H. M. L.

CEREALS 633.1

206. HUNTER, A. W. S.

633.1:576.312.35:582

A karyosystematic investigation in the Gramineae.

Canad. J. Res. 1934 : 11 : 213-41.

The history and present state of the classification of the *Gramineae* are briefly described and the taxonomic value of karyological studies is discussed. The author's present investigation, which was on the same lines as Avdulov's work on the karyo-systematics of the *Gramineae*, supports Avdulov's conclusions (see "Plant Breeding Abstracts" Vol. III, Abst. 40, Vol. IV, Absts. 113, 114 and 156) with a few minor exceptions.

Further work on certain parts of the *Gramineae* is necessary before really valid conclusions can be reached.

There is an extensive bibliography.

207.

633.1-1.557

633.11:575.125

633.16:575.125

ENGLEDOW, F. L. and PAL, B. P.

Investigations on yield in cereals. VIII. Hybrid vigour in wheat.

J. Agric. Sci. 1934 : 24 : 390-409.

Hybrid vigour, as determined by grain yield and tillering rate, was investigated in the F_1 - F_2 of the cross Little Joss x Thule (both *Triticum vulgare*) and also in small parental and F_1 populations in 94 crosses of which fifty-six were between varieties of *T. vulgare* and the rest interspecific crosses between parents of the same or different chromosome number. The crosses were made reciprocally.

Little Joss x Thule clearly displayed hybrid vigour and also in F_1 reciprocal differences in its degree, while in F_2 this difference was slight and the F_3 's were identical in vigour—facts which, considered with other evidence from the F_2 frequency distribution of the number of tillers per plant, argue against the factorial explanation of hybrid vigour.

From the wide range of crosses it was concluded that some varieties had a restricted optimum period for crossing and certain wheats regularly proved more successful as ♀ than as ♂ parents. The F_1 exceeded its parents in tillering capacity and yield in most of the crosses, though there were important exceptions where certain varieties when used as ♂ or ♀ or in both directions of the cross stood out as good or bad in respect of hybrid vigour.

In intervarietal *T. vulgare* crosses the actual crossed grain was generally heavier than in one parent and often heavier than in either. In interspecific crosses, however, a decrease was found in most cases, even where the parents had the same chromosome number.

Certain physiological aspects of the problem are also considered.

From an examination of all the published cases of hybrid vigour it is inferred that the phenomenon occurs preponderantly in crosses among parents which are diploid, naturally out-pollinating and endospermic in seed.

In a few barley crosses apparent hybrid vigour was observed in F_1 , but it was not so marked as in wheat.

208.

AAMODT, O. S. and PLATT, A. W.

633.1-2.111-1.521.6

Resistance of wild oats and some common cereal varieties to freezing temperatures.

Sci. Agric. 1934 : 14 : 645-50.

Comparative tests of the resistance of wild oats (*Avena fatua*) and varieties of wheat, barley and rye to freezing shewed that the former was the most susceptible to injury by the low temperature and had the least ability to survive. There is therefore no danger of wild oats behaving as a winter annual.

WHEAT 633.11

209.

MORRIS, G. P., DIB, M. EL and MUNIR, A.

633.11:575(62)

A record of wheat breeding 1921-1931.

Bull. Tech. Sci. Serv. Cairo 1933 : No. 127 : Pp. 127.

The work described which was begun in 1921 and is still in progress includes :—(1) The trial of Egyptian and imported varieties, their purification and improvement by pure line selection. (2) The production of suitable new varieties by crossing. (3) Observations on the incidence and degree of attack of rust and other diseases. (4) Comparative yield tests. (5) Milling and baking tests. (6) Bulk propagation of the most promising strains.

A list is given of all the indigenous and foreign varieties tested.

Crosses have been made between indigenous varieties, between foreign varieties and between indigenous and foreign varieties with the objects of producing (a) improved high yielding strains of native wheat resistant to *Puccinia glumarum* and *P. triticea* and to smut and including strains with weak flour for native bread and others with strong flour suitable for European bread ; (b) improved strains of Indian wheat, high yielding with stiff straw and resistant to *P. graminis* and *P. triticea* ; and (c) new, high yielding types resistant to rust and smut and to attack by birds and with grain quality suitable to the local demand.

A list is given of the various crosses made and the number of strains derived from them. Data are provided shewing the date of incidence and eventual degree of attack of the three rusts, *P. graminis* *P. glumarum* and *P. triticina* on all the wheats included in the pure line plots at Giza.

Smut is common on many varieties of native wheat and on some of the hybrids with a native wheat as one of their parents but is rare on other wheats in Egypt. A considerable amount of chlorosis and a great deal of variation in the degree of it was observed. Further investigations are being made.

The results of comparative variety tests of the most promising strains are given and also milling and baking tests and the results of chemical analysis.

Several promising hybrid wheats have been produced and some strains isolated which combine a fair yield with 'strong' flour. Among the new wheats being grown in bulk for distribution are a number which shew a remarkable resistance to *P. graminis* and *P. triticina* and in addition are high yielding and of good quality.

210. 633.11:575(94.2)

CALLAGHAN, A. R., BREAKWELL, E. J. and KLOSE, S. R. 633.11:575.11(94.2)

Activities at Roseworthy Agricultural College, 1933-34.

Part III. Cereal breeding, pure seed production and variety trials.

J. Dept. Agric. S. Aust. 1934 : 38 : 12-23.

The methods and results of the cereal breeding work at Roseworthy Agricultural College are described (see "Plant Breeding Abstracts" Vol. IV, Abst. 845).

Of the crossbreds that are promising (Ford x Merredin)⁵ and the (Ford x Carrabin)⁵ are now being tested for yield. The crosses (Onas x Nabawa)⁵, (Nabawa x Canberra)⁴, (Ford x Gloss)⁴ and (Gloss x Florence)⁴ have produced lines of fair quality which are under observation for agonomic characters, yield and disease resistance.

Several improvements that are to be introduced in the technique of breeding and yield testing are mentioned.

The work on pure seed production and wheat variety trials is outlined.

211. HARRINGTON, J. B. and MARSHALL, J. B. 633.11:575.127.2:581.483

F₂ endosperm development in relation to breeding technique with inter-specific wheat crosses.

Canad. J. Res. 1934 : 11 : 333-46.

Interspecific crosses were made as follows: Lumillo (*durum*) x Marquis (*vulgare*), Marquis x Black Persian (*persicum*) and Vernal (*dicoccum*) x Marquis to study the relationship between endosperm development and plant type in the F₂. The data from the last cross have already been published (see "Plant Breeding Abstracts," Vol. II, Abst. 166).

The seeds of the F₂ were divided into three groups, plump (A), slightly shrunken (B) and shrunken (C) and sown, 264 F₂ plants being studied with respect to morphological characters in which the parents differed. Detailed data are given for each cross.

Seedling emergence was closely related to the type of seed. Emergence was best in the A seeds. The results of the three crosses shew that there is a greater preponderance of *vulgare* characters in class C than class B and in class B than in class A, but the proportions varied in the individual crosses.

In deciding which type of seeds to sow therefore each cross must be considered by itself. In the *persicum* x *vulgare* cross the shrunken seeds would be most advantageous while in the other two crosses differences in the plumpness of the seeds need not be considered.

212. AAMODT, O. S. and TORRIE, J. H. 633.11-1.557:581.46:575.11

The relation between awns and yield in spring wheat.

Canad. J. Res. 1934 : 11 : 207-12.

The contradictory results obtained by many workers on the genetic relation between awns and yield in spring wheat are reviewed and an attempt to solve the problem by a study of a number of F₃ lines of Reward x Caesium and a number of awned and awnletted strains of Marquillo x Marquis-Kanred is described.

For the material studied and the conditions of the test no relation was found between grain yield and presence of awns.

213. MILLER, W. B. and MILLIKAN, C. R. 633.11-2.451.3-1.521.6
Investigations on flag smut of wheat caused by *Urocystis tritici* Koern.
Part II.

J. Dept. Agric. Vict. 1934 : 32 : 418-32.

During 1931-33 the reactions to *Urocystis tritici* of the common wheat varieties and the more promising cross-breeds grown in Victoria were tested. Most proved susceptible but some were resistant or moderately so.

Varietal differences in the reaction to "suppressed infection" and their importance in evaluating yields are discussed and exemplified by the severe infection of Ghurka (a "resistant" variety) under certain environmental conditions.

A bibliography of 74 references is appended.

214. NORRIS, G. W. 633.11:664.641.016(94.4)
Bread-making qualities of some new wheat varieties. With notes on the influence of climatic conditions.

Agric. Gaz. N.S.W. 1934 : 45 : 325-29.

Primarily for the information of plant breeders a systematic programme of wheat and flour quality tests and of milling and baking tests of New South Wales wheats has been carried out by the New South Wales Department using the wholemeal fermentation method (see "Plant Breeding Abstracts" Vol. IV Abst. 534). The baking quality of some new wheats and the effects of climate on quality are discussed.

215. BREAKWELL, E. J. 633.11:664.641.016:575(94)
The baking quality of Australian wheats. No. 3. Breeding wheats of better baking quality.

J. Dept. Agric. S. Aust. 1934 : 37 : 1532-39.

Remarks on the technique of hybridization and testing crossbreds for quality and the usefulness of the Pelshenke test occupy the first part of this paper, the second part of which deals with the possibility of selecting for quality within a variety. Supposedly pure varieties such as Ford, Sword and Nabawa have been criticised on account of morphological variation and an effort is to be made to fix the true type of Ford, Nabawa and Bencubbin. Also studies of several well-known varieties have been made recently to determine the extent of variation in baking quality in a number of suitable varieties. The results warrant an optimistic outlook as regards the possibilities of selecting wheats of satisfactory quality from existing varieties. It would seem that the varieties least carefully selected in the early stages of breeding, e.g. Ford and Sword wheats, offer the greatest possibilities of improvement along the above mentioned lines.

OATS 633.13

216. ROBB, W. 633.13:575(41)
Oat-breeding in Scotland. 633.13:575.11(41)

Emp. J. Exp. Agric. 1934 : 2 : 251-57.

The aims and methods in the oat breeding work carried out by the Scottish Plant-Breeding Station are indicated. Hybridization has been extensively used and the genetic analysis of grain colour and striped leaves has been made. (See "Plant Breeding Abstracts" Vol. II, Abst. 6 and Vol. III, Absts. 6 and 146.)

The progress made in breeding for early maturity, resistance to lodging and to shedding of the grain is outlined and also the work on the comparison of new hybrid selections that appear to be fixed.

Among the new varieties now registered for commercial use are Elder, Bell and Early Miller whose parentage and characteristics are given.

217. SPIER, J. D. 633.13:575.127.2:576.354.46
Chiasma frequency in species and species hybrids of *Avena*.
 Canad. J. Res. 1934 : 11 : 347-61.

Tables are given shewing the number of bivalents per cell with zero, one, two, three or four chiasmata in diploid, tetraploid and hexaploid species and in triploid, pentaploid and hexaploid

hybrids. The average number of chiasmata per cell for *A. brevis* and *A. strigosa* = 15.30 and 15.15 respectively, for *A. Wiestii* ($n = 7$) 13.25. The difference between this and the two former species is significant. Significant differences in chiasma frequency were observed, though to a lesser degree, between the tetraploid species *A. barbata* and *A. abyssinica* ("naine"), viz. 29.42 and 26.15 respectively. There was no significant difference between *A. sterilis* and *A. sativa*, var. Radnorshire Sprig, the only hexaploid species examined. The hexaploid hybrid of *A. sterilis* x *A. sativa* had a chiasma frequency more or less equal to the lower parent, *A. sterilis*, and differed statistically from the other parent. The frequency in the pentaploid hybrid *A. abyssinica* ("naine") x *A. sterilis* was below both parents, 13.32 univalents being present, only six trivalents in 30 cells selected at random and no quadrivalents. The number of chiasmata in the triploid hybrid *A. barbata* x *A. sterilis* was greater although there were at least five univalents.

In the diploids the average chiasma numbers shew a fairly close agreement with the degree of relationship of the species according to Thellung's arrangement. This agreement fails however in the tetraploid species. Furthermore, there is no indication that chiasma frequency is reduced in the polyploid species by competition in pairing; there seems rather to be an opposite tendency, namely to a multiplication of genes favouring synapsis and chiasma formation in the polyploid species and thus masking interspecific differences. The high chiasma frequency in the triploid suggests that *A. barbata* and *A. strigosa* are closely related, as indicated also in the chiasma frequencies of the pure species. Judged by the chiasma frequency the relationship between the species constituting the pentaploid hybrid would be low and that between the species in the hexaploid hybrid high. Many other factors also affect chiasma formation however and some of these are enumerated.

218. 633.13-2.111-1.521.6:578.081
 MATHER, K. and ANDERSSON, G. 633.13-2.111-1.521.6:575.11

The determination of winterhardiness in oats.

J. Agric. Sci. 1934 : 24 : 627-35.

An account of comparisons of cold resistance, as determined in the laboratory, and winterhardiness as determined in the field, of certain English oat varieties. There was remarkable parallelism between the results obtained by the two methods and it is concluded that freezing experiments provide a real test of winter hardiness.

Incidentally complicated segregation was observed in winter hardiness among the progeny from a Grey Winter x Argentine cross. In 190/1/5 and 109/3/8 oats (new English forms under test) there appears to be transgressive segregation.

RYE 633.14

219. 633.14:575.14
 PETERSON, R. F. 633.14:581.162.5:575.11

Improvement of rye through inbreeding.

Sci. Agric. 1934 : 14 : 651-68.

The present paper represents a study of the inbreeding method as applied to rye with the special object of increasing the set of grain and grain weight. Strains of Minnesota No. 2 rye were used in the experiments and one strain of Abruzzes rye. The heads were isolated by means of parchment bags. Strains selected for high self-fertility and selfed for a number of generations shewed an increasing percentage of self-fertility up to the seventh generation after which the average percentage set of grain became fairly uniform. Strains selected for high self-fertility (with an average percentage of grain setting of 20-60) and for low self-fertility (below 10 per cent) were variously crossed and the progenies selfed up to the F_6 . The progenies of the high x high and high x low fertility crosses shewed high fertility and the low x low fertility crosses gave progenies of low fertility like their parents. The seed also of the first two crosses was plumper and germinated better than that from the low x low fertility crosses. The apparent dominance of high fertility is explained by the assumption of sterility factors influencing pollen tube growth in the styles on the lines of the work of East and others. Three "synthetic" varieties of selected high self-fertility strains of Minnesota No. 2 rye were compared with the original Minnesota rye and shewed a higher average set of grain and 1,000 corn weight.

MAIZE 633.15

220. 633.15:575
 McMILLAN, J. R. A. and BRYAN, W. W. 633.15:575.1(94.3)
Maize breeding at the Queensland Agricultural High School and College.

J. Coun. Sci. Ind. Res. Vict. 1934 : 7 : 157-60.

The methods and aims of the maize breeding work at the Queensland State Agricultural College are described. The probable importance of selection in sib-crossed lines is made clear. It seems likely that new strains higher yielding than existing ones may be produced.

RICE 633.18

221. 633.18:575(68.9)
 BARKER, F. 633.18(68.9)
The rices of Northern Nyasaland.

Bull. Dept. Agric. Nyasaland 1934 : No. 12 : (N.S.) : Pp. 15.

Having considered the origin of rice cultivation in Northern Nyasaland and the types found there, a preliminary classification and agricultural description is given of the 10 varieties cultivated, which can best be characterized in general as between the lowland and upland types. To improve the quality of rice grown, pure seedlings of any one variety, instead of mixed seedlings, have been encouraged ; and mass seed-selection by growers in their own cultivations as well as the use of the better quality rices, faya, msafili, maliya and mele has been recommended.

222. KADAM, B. S. and PATANKAR, V. K. 633.18:575.11.061.6
Inheritance of chlorophyll in Zinya rice.
 Poona Agric. Coll. Mag. 1934 : 26 : 10-16.

Breeding experiments shewed clearly that two recessive genes *w* and *y* are respectively responsible for white and yellow chlorophyll deficiencies in Zinya rice. In the case of the white seedlings derived from one panicle a monohybrid ratio of three normals to one albino was obtained, except in one case in which the segregation suggests a dihybrid ratio. The yellow seedlings, like the albinos, obtained from a second panicle of Zinya rice never developed any chlorophyll and eventually perished. Here too a monohybrid ratio of three normals to one yellow was found in contrast to Ramiah's results (See " Plant Breeding Abstracts," Vol I, Abst. 453.) The white and yellow types are both regarded as being probably mutations.

223. MITRA, S. K. and GANGULI, P. M. 633.18:575.11.061.634
Inheritance of albino and white-striped characters in rice.
 Ind. J. Agric. Sci. 1934 : 4 : 537-45.

A fuller analysis of the data summarized in " Plant Breeding Abstracts " Vol. IV, Absts. 33 and 34.

ROOTS AND TUBERS 633.4

224. 633.42:576.312.3
633.426:576.312.3
 CATCHESIDE, D. G. 633.42:575.127.2:633.426:576.312.3
The chromosomal relationships in the swede and turnip groups of Brassica.
 Ann. Bot. Lond. 1934 : 48 : 601-33.

In the swede group, swedes, swede-like rape, certain bulbless bolters appearing as rogues in the crops, and hybrids between them were examined cytologically. All had 36 2n chromosomes and 18 bivalents at meiosis at which all the forms shewed a remarkable similarity of behaviour. A considerable amount of secondary pairing was observed in the groups. Trivalents and quadrivalents occur and the swede is considered to be a secondary balanced polyploid. In the turnip there are ten bivalents at diakinesis and they shew frequent secondary pairing. It is suggested that six is the original basic chromosome number as in the swede and that the turnip is tetrasomic in respect of four of them, assuming that two pairs of non-homologous chromosomes are segmentally interchanged.

A swede-turnip hybrid was also examined. The results differed from those of Morinaga. Bivalents from 7-12 occurred and 0-3 trivalents. The least amount of pairing was 10 bivalents and 8 univalents. More secondary pairing was observed than in the turnip and is taken to indicate some autosyndetic pairing of swede chromosomes. The behaviour of the chromosomes during the reduction division is described and the possible formation of amphidiploids discussed. It appears from the data that there is a close relationship between all the forms belonging to the swede group and the occurrence of "bolters" in a swede crop is due to admixture of swede-like rapes and their hybrids with swedes.

The occurrence of duplicate factors in *Brassica* is explained by the secondary balanced polyploidy observed. Polyploidy in *Brassica* is discussed.

FIBRES 633.5

225. STOCK, T. D.

633.51:575(59.2)

Burma cotton and its improvement.

Agric. Survey Dept. Agric. Burma 1933: No. 18: Pp. 17.

The types of cotton grown in Burma and its cultivation are described.

The bulk of the commercial cotton is a mixed crop of early maturing types known as Wagale and improvement in the direction of a drought-resistant strain of early maturity and good ginning out-turn is desired. Selections and crosses have been made with this aim in view and hybrid strains shewing marked improvement have been obtained. Further crosses are being made to combine their desirable qualities.

The results of inbreeding shewed that this might be continued long enough to establish a pure line without danger of sterility or appreciable loss of vigour. After the pure line has been established mass selection is advised.

Means for the extension of improved cotton are discussed.

226.

633.51:575(66.9)

Cotton breeding problems in Northern Nigeria.

Rep. and Summary Proc. 2nd Conf. Cott. Grow. Prob., Emp. Cott. Grow. Corp. 1934: 60-67.

The conditions under which cotton is grown are described and an account given of the introduction of various types of cotton and of the selection which has been undertaken. As a result one strain, L, derived from Allen Long Staple, remains and it is now being crossed with H 21 and U 4/123 from South Africa.

In the discussion it was pointed out that most of the varieties noted were late maturing and what seemed to be required for the peculiar local conditions was early maturity. H. M. L.

227. PEAT, J. E.

633.51:575(68.9)

Further notes from the Cotton Station, Gatooma.

Rhod. Agric. J. 1934: 31: 665-72.

Several of the jassid-resistant U.4 strains raised at the Cotton Station, Gatooma, especially early maturing and heavy yielding derivatives of U.4/64 (Gatooma 5), can give satisfactory yields in spite of American bollworm attack.

Of the families other than U.4/64 only U.4/26/B/2 (Gatooma 2, 26) has been comparable with the /64 derivatives. Strain /26/B/2 matures fairly early and fruits freely but the lint quality is only moderate.

Of two strains in bulk which are being distributed for next season, namely /64/7/10 (Gatooma 5, 11) and /64/V (Gatooma 5, 21), the first matures earlier than 64/V and is more open in habit—both characters of possible importance in bollworm resistance—but jassid resistance is not so good and the second named strain is superior in lint quality and ginning percentage as well as in jassid resistance.

Some improved lots of /64/7/10 type with a slightly better jassid resistance, early and more uniformly heavy yielding have been multiplied.

Efforts are now concentrated on selecting out from either the /64/V or the /64/7/10 lots a strain combining the good qualities of both.

228. HARLAND, S. C. 633.51:575(72.98)
The work of the St. Vincent Cotton Station.
 Emp. Cott. Grow. Rev. 1934: 11: 300-09.

This paper gives, in semi-popular form, an account of the history of the St. Vincent station and of the present work.

Angular spot no longer constitutes a serious pest. Resistant lines have been isolated by repeated selection in single plant cultures of those plants in which 100 per cent infection is reached only at the end of the season.

Between 1926, when the station was closed, and 1930 when it was reopened admixture had taken place in the pure lines. Reselection has since been made by a 'bulk sample method' and a Sea Island Superfine with lint length ranging from 57-62 mm. has been secured in one year.

For the preservation of pure lines the desirability of 'tagging' a particular combination of recessives so that natural crosses may be readily distinguished, is discussed. After four back crosses, the red plant body and the weak spot of the Peruvian type, *G. barbadense*, has been imposed on a plant otherwise indistinguishable from Sea Island. If spinning tests prove satisfactory, this cotton will replace the present type.

Improvement of the perennial Cotton grown in the Grenadines, *G. barbadense* and *G. purpurascens*, has been attempted in two directions. Selections have been made in Moco, a Bourbon cotton from north Brazil and relatively pure strains obtained with a lint length of about 47 mm. Selection has also been made with the Marie Galante cotton by the bulk sample method and a commercially pure line with a staple somewhat superior to Sakel. is now available.

Attempts are being made to develop the potentialities of the Jassid resistant South African cotton, U4, by crossing and subsequent back-crossing to U4. Material from the second selfed generation from the back-cross is now under test in South Africa.

With the object of improving the Nigerian cotton, Ishan has been crossed with Sea Island. It will be subjected to three generations of back-crossing and then selfed.

It is noted that, in 1929, a hybrid between a Sea Island-Egyptian F_1 and a red flowered *G. arboreum* was obtained which was partly fertile on the male side. Back-crosses to New World types have successfully shown increased fertility and a cotton with bright red edges to the petals has been obtained which is completely fertile and shows no abnormalities in the reduction division. The possibility of transferring the resistance to adverse conditions shown by Asiatic cottons to cottons of the New World has become a realizable objective. Use is also to be made of *G. aridum* (*Erioxylum aridum*) and *G. Harknessii*, two New World cottons with 13 pairs of chromosomes.

H. M. L.

229. HARLAND, S. C. 633.51:575.11.061.6:575.127.2
The genetics of cotton. Part XI: Further experiments on the inheritance of chlorophyll deficiency in New World cottons.
 J. Genet. 1934: 29: 181-95.

In an earlier paper (see "Plant Breeding Abstracts," Vol. II, Abst. 548) the isolation of a chlorophyll deficient type of cotton which could be produced from seeds was described. This occurred in the *G. barbadense* (Sea Island or Egyptian) $\times$ *G. hirsutum* (Upland) cross usually in the ratio of 15:1. Here representatives of the six taxonomic species into which the New World cottons are divided were crossed with standard chlorophyll deficient and the F_1 back-crossed to chlorophyll deficient. The results are as follows:

G. hirsutum L. A mixture of monomeric and dimeric forms. ($C_{Ha}C_{Hb}$ or $C_{Ha}C_{Hb}$).

G. barbadense L. A monomeric form. ($C_{Ha}C_{Hb}$).

G. purpurascens Poir. Of the 25 types examined 21 were dimeric ($C_{Ha}C_{Hb}$ or $C_{Ha}C_{Hb}$); 2 a mixture of monomeric ($C_{Ha}C_{Hb}$) and dimeric forms; and 2 (from Patos, an island near Trinidad, and from Polynesia), exhibiting many points of similarity to *G. taiense*, monomeric.

G. taiense Parl. A monomeric form. ($C_{Ha}C_{Hb}$).

G. Darwinii Watt. A monomeric form. ($C_{Ha}C_{Hb}$).

G. tomentosum Nutt. A dimeric form. ($C_{Ha}C_{Hb}$).

These genetic constitutions of the various species are further checked by interspecific crossing. In the discussion of these results it is pointed out that the distribution of a gene in the several species of a genus has not often been investigated but has an important bearing on evolution.

It is assumed that Skovsted's suggestion that the New World cottons with 26 pairs of chromosomes are allopolyploids, is correct. Duplication of factors is considered to have taken place through polyploidy with subsequent mutation of one or other of the members. *G. barbadense* and *G. Darwinii* have lost the factor C_{hb} , *G. taitense* and *G. purpurascens* and *G. hirsutum*, when these two latter are monomeric, have lost C_{hs} .

It is further pointed out that the results support Haldane's view that in polyploidy one member of a pair of genes may mutate without disadvantage and that polyploidy, even allopolyploidy, may release a large number of genes for mutative purposes with concomitant augmentation of genetic variance. It is further suggested that the extent to which the dimeric condition is converted to the monomeric in polyploid species may provide some indication of the age of the species. In *Gossypium* only a few cases of duplication occur, most of the factors being monomeric. The whole evidence accords with the conclusion that the New World cottons are an old allopolyploid series.

H. M. L.

230. HARLAND, S. C. 633.51:575.127.2

The value of inter-specific hybrids in cotton from the standpoint of genetics.

Rep. and Summary Proc. 2nd Conf. Cott. Grow. Prob., Emp. Cott. Grow. Corp., 1934 : 22-30.

The writer's visit to Turkestan and inspection of the Upland-Egyptian hybrids there growing on a vast scale lead him to doubt the Russian claim that such hybrids offer great possibilities. The fundamental difficulty in the way of practical success with inter-specific crosses in cotton has lain in the doubtful taxonomy. This is now being gradually unravelled.

In the 13 chromosome Asiatic group the problem of improvement seems to lie in the synthesis of the economic characters already extant in one or other form through crossing with *G. anomalum*, a wild Somaliland species, and the possibilities of artificial tetraploidization are worth investigating.

In the 26 chromosome New World group there are 7 species and the taxonomic relationships of these are briefly described. It is suggested that in some cases, such as Upland and Sea Island-Egyptian, each species possesses a co-ordinated gene system adapted to a given set of environmental conditions and that to cross them partakes of the nature of trying to build a better car by combining the parts of two cars of different makes.

Before indulging in speculation on the value of such crosses, it is necessary to have information as to the extent to which single genes can be transferred from one species to another and the extent to which whole sections of chromosomes can be so transferred. Results bearing on these questions are described. In work of this nature the technique of the back-cross would have to be used.

The discussion centred on the question why back-crossing was of greater value in the technique of inter-specific crosses than in that of inter-varietal crosses. It was pointed out that the reason partly lay in the fact that the F_1 and later generations of inter-specific crosses were frequently self-fertile; also there is generally a lack of vigour resulting from chromosome irregularities and which is largely overcome by retaining one set of chromosomes as a going concern. The back-cross was particularly useful when it was desired to introduce one character only into a plant in other respects satisfactory.

H. M. L.

231. HARLAND, S. C. 633.51:575.148:575.42

Selection effects in pure lines of Sea Island cotton self-fertilized for seventeen generations.

Rep. and Summary Proc. 2nd Conf. Cott. Grow. Prob., Emp. Cott. Grow. Corp., 1934 : 31-46.

The 'lint index' (weight of lint per seed in mg.) has been shown in Montserrat, where the Heaton variety of Sea Island cotton is grown, to have a high correlation with yield and is, therefore, an important character. The paper details the results of selection for lint index in material self-fertilized for 17 years, the basis of selection being the mean of the strain and not the single plant. Plants with lint indices of 71 and 74 have been obtained and these are higher than any previously obtained in Sea Island cotton.

The results are concordant with the view that the original strain was enormously heterozygous or that numbers of plus mutations have arisen. Behind this lies the question of what is meant by 'purity.' As pointed out in the discussion, this is a relative term dependent on the extent to which the tests applied are discriminating. The practical corollary is the need for a large number of self-fertilized generations for effective purity.

In the discussion it was pointed out that selection was effective early and then again after 13 years and the question was raised whether self-fertilization was, in fact, effectively achieved. Reference was also made to 'place effect' as evidenced in Queensland. H. M. L.

232.

633.51:575.42(54.7)

Note on the improvement of cotton in Sind.

Ind. Cent. Cott. Comm. 1934: Pp. 8.

The opening of the Lloyd Barrage has increased by about five times the area to be put under cotton cultivation, the question of suitable strains is therefore of considerable importance.

Work is being done on the four main classes of cotton, Sind Deshi, Punjab-Americans, imported Egyptians and the following improved strains are described: the American cottons 4F-98 with a ginning percentage of 34 and a high yield, 289F-1, hardy and resistant to red leaf and jassid and a strain of 285F cotton which combines silkiness with other desirable qualities. Two selected strains of Sea Island and Egyptian cotton, Sea Island 2-4 and Boss III-16 are being tested and the improved Sind Deshi strain 27 W.N. is now the standard deshi cotton in Sind.

A scheme for the multiplication of pure seed is outlined.

233.

633.51:576.312:575

SKOVSTED, A.

633.51:575.127.2:576.356

Cyto-genetics in relation to plant breeding in cotton.

Rep. and Summary Proc. 2nd Conf. Cott. Grow. Prob., Emp. Cott. Grow. Corp. 1934: 46-51.

The two main groups of cultivated cottons are the Old World (Asiatic) with 13 pairs of chromosomes and the New World with 26. Three wild species, *G. tomentosum*, *G. taitense* and *G. Darwinii*, have 26 pairs and the remainder 13. All the Old World cottons are interfertile with normal pairing of chromosomes; cytological studies of the New World cottons are incomplete but they are practically interfertile.

Hybrids between the two groups are rare and are very largely sterile. They have 39 chromosomes and the 13 chromosomes of the Old World forms are able to pair with half the chromosomes of the New World forms, the remainder being left as univalents. Hybrids have also been obtained with *G. aridum* (*Erioxylum*) and *G. Harknessii*, wild species from America with 13 chromosomes. These hybrids have 39 chromosomes and the evidence indicates that pairing takes place with the 13 chromosomes of the New World forms which remained as univalents in the case of the cross with the Old World forms. Both hybrids appear to be slightly fertile. The same is the case with *G. Thurberia* (*Thurberia thespesioides*) though this has not been examined cytologically.

These three species are lintless but may offer the means of introducing into the New World cotton a xerophytic habit and resistance to disease.

A few cases of polyploidy have been observed in Asiatic cottons both in vegetative tissues (root) and in reproductive tissues (pollen and egg). The gametes which could function possessed from 26 to 39 chromosomes and, in one instance, 64. The most promising polyploids are those which arise in somatic tissues.

The discussion emphasized the caution with which the possibility of obtaining results of economic value by crossing between species must be regarded. H. M. L.

234.

TROUGHT, T. and KING, H. E.

633.51-1.421

Preliminary testing of new varieties or types of cotton.

Rep. and Summary Proc. 2nd Conf. Cott. Grow. Prob., Emp. Cott. Grow. Corp. 1934: 51-60.

The method is devised to permit the early test of strains when small amounts of seed are available. One line of the strain is sown between two lines of the control with the plants exactly spaced.

After germination the lines are divided into "triads," i.e., groups of three holes, one of the strains under test and two controls. Plants are cut out so that in each triad the three holes have one, two or no plants. Permissible triads are diagrammatically indicated. All necessary determinations can be made on these triads. It is estimated that an increase of 50 per cent yield warrants increased attention, 20 per cent, a probable real increase and a decrease of 20 per cent withdrawal of attention. Checks, however, with the three lines of the control would indicate that these figures are very conservative.

The method was criticized in the discussion on the grounds that it did not lay itself open to statistical analysis and that the differences claimed to have meaning were so large that the eye would be sufficient guide.

H. M. L.

235. FAHMY, T. 633.51-2.484-1.521.6:575.42
The selection of wilt immune strains of long staple cotton (Sakha 4 Gidid).
 Bull. Tech. Sci. Serv. Cairo 1934 : No. 130 : Pp. 25.

As the resistant strains previously selected (see "Plant Breeding Abstracts" Vol. II, Abst. 355) were inferior either in yield or lint quality to the susceptible varieties of Sakha 4, further selection was undertaken. The new method of selection employed is described in detail and as a result one strain Myco 19 was finally chosen for further quality tests.

The strain finally selected is to be propagated for distribution by the Botanical Section of the Egyptian Ministry of Agriculture under the name Sakha 4 (Gidid). Besides immunity to wilt the new strain has a better yielding capacity and a lint quality as good as the original Sakha 4.

236. DHARMARAJULU, K., SURYANARAYANA, M., 633.51-2.7-1.521.6:575
 GOPALA MENON, E. R. and MARGABANDU, V.
The present position of the cotton stem weevil problem.
 Madras Agric. J. 1934 : 22 : 204-09.

The lines on which the problem of control of *Pemphres affinis* is being approached are :—

- (1) The selection and isolation of resistant and tolerant types.
- (2) Vernalization and the production of types of cotton which allow of two early harvests followed by a long closed period.

Among the defence mechanisms that are being investigated as possible potential genetic characters are pubescent hypocotyl and the capacities for gum and gall formation.

237. WILKINSON, J. 633.584.3:575.12:576.312.34
 633.584.3:576.16:576.312.34
A preliminary report on a cytological method of distinguishing *Salix alba* var. *coerulea* from closely related species, varieties, and hybrids.
 Forestry 1934 : 8 : 64-66.

Using root tips as material and a technique specially elaborated, a number of *Salix alba* varieties and hybrids involving *fragilis* were examined and the somatic chromosome complement proved to be 76 in all cases. Though the 76 chromosomes in the *S. alba* complement are small and mostly individually indistinguishable morphologically, evidence suggests that differences between the *alba* varieties can to some extent be correlated with the number of satellites. *S. alba* var. *coerulea* shewed only two chromosomes with satellites while the other *alba* complements shewed at least four.

Certain characteristics of the *S. alba* and *S. fragilis* complements are described. Attempts to identify these recognisable chromosomes in the hybrids of the *viridis* type have met with some success.

There are also some indications that the nature of the cytoplasmic background might help to verify results based on morphological observations alone.

Further examination of *coerulea* from different localities is contemplated to test the validity of the above results.

SUGAR PLANTS 633.6

238. HILL, A. G.

633.61:575

A review of recent methods and results in sugar-cane breeding.

Emp. J. Exp. Agric. 1934 : 2 : 285-92.

A review of the more recent methods and results of sugar cane breeding in the main countries where this is undertaken. After a brief mention of the outstanding results of the past, the various methods of effecting artificial crossing are described, reference being made to special points of difficulty: the SO_2 method is regarded as of doubtful value as regards the female arrows owing to the damage caused to them and possibly also to the seedlings formed. With regard to seedling selection it is pointed out that in the case of seedlings of partially wild parentage early vigour is a doubtful criterion of later success and the seedling method will probably have to be confined to noble canes.

Among the methods suggested for overcoming the small amount of material for first yield trials are the use of each node of the original plant as a single-eye cutting, which has been shown to give a yield equal to that of a whole sett under nursery conditions and treatment with a saturated solution of lime, which greatly enhances the germination capacity of the setts.

Since weight of stool and sucrose content are now known not to be correlated, it is recommended that the first year selections be made according to weight and selections for total solids, etc. be made later.

239. KERR, H. W.

633.61:575(94.3)

New cane varieties in the Southern districts.

Cane Growers' Quart. Bull. 1934 : 2 : 13-15.

A breeding programme aiming at the production of a cane with high resistance (or practical immunity) to gumming disease, vigour of growth and drought resistance, good ratooning qualities and satisfactory sugar content has resulted in the selection of six promising varieties at Bundaberg Station in 1932. Of these Co. 290 and P.O.J. 2735 were particularly promising as regards several of the required characteristics and also gave 22.8 and 16.8 tons respectively of cane per acre as compared with the standard variety which gave 9.3 tons per acre.

Tests are still in progress.

240.

633.61-2-1.521.6

Disease resistance trials.

Cane Growers' Quart. Bull. 1933 : 1 : p. 56.

650 new varieties, including 620 seedlings raised by the Bureau were tested in 1933 for gumming resistance and 600 more for leaf-scald resistance, with the main object of ascertaining which crosses are likely to yield disease-resistant progeny.

241.

633.61-2-1.521.6:575

The Queensland Sugar Experiment Stations.

Int. Sug. J. 1934 : 36 : 387-88.

About 40,000 seedlings from controlled crosses are planted annually as a preliminary to disease resistance trials and the most promising families are tested for leaf scald, downy mildew, gumming and red stripe separately.

The agricultural value of a cane seedling which was bred in 1932 and shewed outstanding juice quality (C.C.S. value of 22.8 per cent at maturity) is now being tested.

Varietal resistance trials are also carried out. Among the imported canes that have shown high yield and very high resistance to gumming are Co. 290 and P.O.J. 2725.

242.

633.61-2-1.521.6:575(94.3)

Seedling propagation.

Cane Growers' Quart. Bull. 1933 : 1 : p. 46.

With the object of obtaining superior and disease resistant varieties the Bureau of Sugar Experiment Stations, Brisbane, propagates annually about 20,000 seedlings. Cross pollination is performed at South Johnstone and Freshwater and selections of the seed thus obtained are germinated at the three Experiment Stations of the Bureau. Approximately 10,000 selected seedlings

are planted each year at the South Johnstone Station and 5,000 at each of the Central and Southern Stations.

In this way it is hoped to propagate and select new canes specifically adapted to the peculiar environmental conditions in which they will ultimately be grown.

243. TUCKER, R. W. E. 633.61-2.7:575:581.192
Varietal factors in cane which may influence extent of oviposition by *D. saccharalis* and a possible method for determining varietal susceptibility to borer attack.
 Agric. J. Barbados 1933 : 2 : No. 4 : 53-59.

It is suggested that the factor of high percentage of dry matter in the leaf spindle is correlated with a relatively lower borer infestation and should therefore be made the criterion for susceptibility to moth borer attack and also should be regarded as a desirable quality to breed into canes.

244. B[ELL], A. F. 633.61-2.7-1.521.6
The resistance of the seedling S.J. 4 to grub damage in North Queensland.
 Cane Growers' Quart. Bull. 1934 : 2 : 9-10.

During the past season it has been evident that seedling S.J.4 bred at South Johnstone Station, has considerably greater power of resistance to grub attack than any other commercial variety in North Queensland.

245. TAYLOR, J. H. and PICKLES, A. 633.61-2.7-1.521.6:575
The influence of cane variety on susceptibility to froghopper blight.
 Proc. Sug. Cane Invest. Comm. 1934 : 4 : 326-30.

The froghopper resistance of a number of cane varieties is discussed. The conclusions are to be amplified by morphological studies of the different varieties with a view possibly to identifying some morphological character which may be at least partly responsible for the variation found in susceptibility and towards which breeding work might be directed.

Some years' experience in different localities has shewn Co.213 to be the most resistant and to recover well even when attacked.

246. 633.63:576.16:581.9
Wild and cultivated beets. Infusion of wild beet blood.
 Brit. Sug. Beet Rev. 1934 : 8 : p.33.

A short note on theories of the possible origin of the modern sugar beet of Europe and America and on the distribution of *Beta maritima* and the differences in the types found in Northern and Southern Europe. (See "Plant Breeding Abstracts," Vol. III, Abst. 664).

STIMULANTS 633.7

247. GOPALARATNAM, P. 633.71:581.162.3:578.08
On crossing tobacco.
 Madras Agric. J. 1934 : 22 : 283-85.

The special advantages claimed for this modification of G. L. C. Howard's method of emasculation are (1) easy and rapid manipulation, (2) certainty of the removal of all anthers, (3) the corolla tube remains turgid for one and a half days without shrivelling or pressing on the stigma, (4) pollination and fertilization are invariably effective because the dusted stigma remains in the middle of the tube and the pollen is not rubbed off.

248. MYERS, J. G. 633.74(88)
 634.771(88)
Observations on wild cacao and wild bananas in British Guiana.
 Trop. Agriculture, Trin. 1934 : 11 : 263-67.

In view of the genetic importance of wild types of cultivated plants descriptions are given of stands of wild cacao, plantains and bananas not previously visited by a white man.

249. POUND, F. J. 633.74:575.11.061.6

A preliminary survey of pigment factors in cacao.

3rd Ann. Rep. Cacao Res., Trinidad 1933 : 11-15.

An attempt was made to discover if there existed any correlation between pigmentation of the bean and of other parts of the plant so that those plants with pigmented beans could be discarded at an early stage. Pigmentation of the bean in Forastero types is a dominant character determined by a single basic pigment factor pair with one or probably more modifying genes and may be still more complex.

Further analysis is needed to elucidate the inheritance of pigmentation in the pod but the ratio of pigmented to unpigmented pods shews that pigment is probably not always dominant to unpigmented. Axil spot was determined by two pairs of genes and correlated with pod colour.

Data given indicated that in the trees examined the factors which produce pigment in the young leaves are not the same as those producing pigment in the cotyledons and there is no evidence for linkage between them.

The evidence for correlation between pod colour, flush and axil spot is very incomplete but such as it is it suggests that there is some association, probably complex, between the factors responsible for these pigments. The difficulties of a study of the inheritance of the pigment in cacao are increased by the complex ancestry of the Forastero types and this is briefly discussed.

250. CHEESMAN, E. E. and POUND, F. J. 633.74:575.42

Further notes on criteria of selection in cacao.

3rd Ann. Rep. Cacao Res., Trinidad 1933 : 21-24.

The present paper represents an amplification of the methods and criteria for the selection of desirable types of cacao trees discussed in the Second Annual Report. It is held that the cacao population in Trinidad is probably the most complex in the world and that therefore problems of all possible types with regard to genetical constitution are encountered and the results should be of value to all other cacao growing regions of the Empire. The question of selecting types of genetical value and not merely those favoured by the environment is discussed, the final test being a comparison of the progeny. As to the problem of partial self-sterility, the results have shewn that those trees which are selected as high yielding are also always probably self-compatible but the possibility that self-incompatible trees may occur among seedling progenies must be borne in mind.

In considering productive efficiency many other factors besides yield per tree must be taken into account, the size of tree being of particular importance and it has been found necessary in selecting trees to make a correction for size by estimating the area occupied or making from it a calculation of the theoretical yield of an acre of trees of identical size and genotype. It has been found that of trees producing equal quantities of cacao per unit of land the most efficient are those with relatively few large pods. It must always be remembered that a type that does well in one environment may be quite inefficient in another and the suitability of the various types to different localities is being further studied. Only trees yielding seven pounds and upwards of dry cacao per tree are selected, the limit varying according to the bean weight.

251. POUND, F. J. 633.74:575.42(72.98)

The progress of selection, 1933.

3rd Ann. Rep. Cacao Res. Trinidad 1933 : 25-28.

Eighteen trees which on account of their extreme efficiency have been given Imperial College Selection numbers and which will be included in the comparative tests to be carried out on the 100 best trees are described.

252. FREEMAN, W. E. 633.74:581.47:575.11.061.6

The inter-relation between pigment and pod morphology in cacao.

3rd Ann. Rep. Cacao Res. Trinidad 1933 : p. 33.

The crop in general is discussed including what is known about pollination, and the methods and material used for the study of the main problems are given in Part I. Part II summarizes the results in the form of correlation tables.

There are indications of a negative correlation between pod colour and bean pigment. No correlation was found between flesh colour and bean colour except in trees with no flush pigment at all, and none between bean colour and axil spot.

As regards bean colour and pod shape, the data indicate that the type with the largest percentage of light beans is always the one which exhibits the greatest number of Criollo genes. The data given support the view for a positive correlation between pod colour and the presence of axil spot. The correlation between warts and ridges is also positive.

253. POUND, F. J.

633.74-1.541.1:575.2

The variability of budded cacao.

3rd Ann. Rep. Cacao Res. Trinidad 1933 : 15-21.

A comparison of the variability of a series of budded clones with seedling progenies from the same parents shewed that with regard to bearing, although the budded clones do not give a very uniform yield, the variation in the number of pods produced per annum compared with that of the seedling progenies is reduced by more than 30 per cent. It is suggested that a further reduction of variance might be brought about by the use of genetically uniform root stocks. With regard to pod value it was found that on the whole a clone in the field shewed no greater variability than the individual tree.

Data are given to shew that the root system may definitely influence the size of the bean produced by the scion and possibly the number of beans per pod.

RUBBER PLANTS 633.9

254. CRAMER, P. J. S.

633.912:575.42

Rubber. The use of improved planting material. (Contd.)

Trop. Agriculturist 1934 : 83 : 3-7.

Observations during the author's recent tour in the East suggest that seedlings obtained by controlled crosses in which both parents are known or by self-fertilization may give average yields as high as, or even higher than the yields from clones, though owing to the generally wide variation in seedlings, a certain percentage of plants of no value will always appear. Moreover, the technical difficulties of controlled pollination and the low set of seed render it unlikely that seed will ever be obtainable in commercial quantities by this method.

A comparison of tappings from buddings and seedlings from a number of clones shewed that in general the unselected seedlings gave a lower average than the unselected buddings but the range of variation for these last was much wider than for the seedlings, so that the average yield for the 25 per cent best individuals was higher for the seedlings than for the clones.

It is probable that by planting clonal seeds, using a very dense initial stand and applying regular selective thinning from an early stage onwards, higher yielding plantations could be obtained than from buddings.

Ashplant's method of identifying the inherently high yielders by the diameter of the latex vessel and the author's system of seedling selection based on a method of tapping with a set of V-shaped knives are described. The system which can be used in nurseries or in direct plantings is being tested in the Federated Malay States and seems to promise success. The selection too of the clones from which seed is obtained must receive attention.

FRUIT TREES 634

255. STRICKLAND, A. G.

634.1/2:581.162.3

Pollination problems.

J. Dept. Agric. Vict. 1934 : 32 : 391-97.

The first part of this paper contains a survey for the grower of the problem of fruit pollination considered under its two main aspects, (1) the relative ability of varieties to set fruit with or without cross-pollination, the varieties most needing pollination and the best pollinators to use ; (2) pollen distribution in the orchard and how to ensure the maximum advantage therefrom.

The second half of the paper is a progress report on pollination experiments with a considerable number of varieties of apples, pears and cherries.

256. HOOPER, C. H. 634.11:581.145.1:581.162.32
Apples, the relative order of flowering of the different varieties and its bearing on cross-fertilization.

J. S.-E. Agric. Coll. Wye 1934 : No. 34 : 210-15.

Records have been collected from a number of centres in England and from the author's observations on the approximate average order of blossoming of the apples most commonly grown for market ; and the results are tabulated. A list shewing the relative earliness or lateness of flowering of a considerable number of varieties is also given with a diagram representing the self-fruitfulness or self-sterility of a number of varieties.

Some comments on cross-pollination relationships among certain well-known varieties conclude the article.

257. BRITTAIN, W. H. 634.11:581.162.3
Apple pollination studies in the Annapolis Valley, N.S., Canada.
 1928-32.

Bull. Dep. Agric. Can. 1933 : No. 162 : (N.S.) Pp. 198.

A detailed account of the conditions of apple pollination of Nova Scotia and the results of experiments for its improvement.

258. DWYER, R. E. P. and BOWMAN, F. T. 634.13:581.162.32
The value of cross-pollination for Williams pear.
 Agric. Gaz. N.S.W. 1934 : 45 : 341-43.

The greater self-fruitfulness of the Williams Bon Chretien pear (also called the Bartlett or Duchess) as compared with Packham's Triumph has been shewn to be due to the greater capacity to produce fruits from self-pollination and to develop parthenocarpic fruits. These varietal characteristics mask the necessity and value of cross-pollination for this pear. Extensive observations have, however, demonstrated that artificial cross-pollination of the Williams pear with other varieties gave an average set of 30 per cent or practically six times the set obtained from self-pollination under the same conditions and also that the fruit had a high seed content in contrast to the little or no seed development obtained with self-pollination.

Attention is drawn to the advantages of cross-pollination in increasing the yield and of the high seed content in improving the shape, size, weight and eating qualities of the fruit and in reducing natural shedding or windfalls.

259. FIKRY, A. 634.22-2.19-1.521.6
Water-table effects. 1. The gumming and death of plum trees.
 Bull. Tech. Sci. Serv. Cairo 1934 : No. 141 : Pp. 35.

Gumming is a physiological disease directly caused by a high sub-soil water-table during the period of the Nile rise.

The results and observations on the resistance of varieties to the disease shewed that of root-stocks Mariana is the most resistant with 84 per cent resistance, Myrobolan is moderately resistant and apricot and peach stocks are susceptible.

The most resistant scions are America, Japanese Gold, Climax and Mariana ; Bokra, Myrobolan and Excelsior are fairly resistant. Wickson is most susceptible.

The data indicate that increase in stock resistance raises the degree of resistance in the scion. Examinations of the root systems of resistant and susceptible stocks shewed that the shallow rooting stocks are resistant and those that are deep-rooting are susceptible.

Deep drainage is advocated for a control of the disease.

260. WILLIAMS, R. O. 634.337:575
Wither-tip disease and limes.
 634.337-2.44-1.521.6:575

Proc. Agric. Soc. Trin. Tob. 1934 : 34 : 275-81.

Direct control of wither-tip disease of limes being impracticable, in 1920 efforts were made to obtain by introduction, a lime equal in quality to the West Indian Lime and at the same time wither-tip resistant. The nearest approach to this West Indian Lime was Seedling No. 2182

from the Philippines, which closely resembles the lemon in growth and colour of flower and is resistant. This fruit, though not a satisfactory substitute, was crossed in 1925 with the West Indian lime in hopes of obtaining the required type. Where the Philippine lime was used as the female parent all the seedlings raised bred true to the mother type. From the reciprocal cross 7 seedlings were selected as resistant to withertip and of these two, viz. T.1 and T.6 were selected for field trials. In 1928 the first series of Trinidad hybrids were back-crossed to the West Indian lime and experiments with the progeny are still in progress.

T.1 which has proved better than T.6 begins to bear at a very early age and yielded 127.72 barrels per acre in 1933 when $3\frac{1}{2}$ - $4\frac{1}{2}$ years old. The acid and oil contents have been examined and T.1 limes are regularly sent to New York and Canada at the same prices as the West Indian, though a large scale commercial test has still to be made.

261. MARALIHALLI, S. S. 634.58:575.22:519.241.1
Study of correlations of branches, flowers, pods and yield in ground-nut.

Poona Agric. Coll. Mag. 1933 : 25 : 24-29.

Using the following types of *Arachis hypogaea*, Spanish peanut, Japan and Strain No. 5, a number of positive, close and significant correlations were found between pairs of the following characters which are of value in selection work : number of branches, of pods, of flowers per plant and yield.

262. CHILD, R. 634.61:575(54.8)
Review of the activities of the Coconut Research Scheme of Ceylon.
 Trop. Agriculturist 1934 : 83 : 56-63.

The genetical work under the Coconut Research Scheme aims at the improvement of the coconut palm as an agricultural crop by the selection and propagation of selected types from the widely different types found in Ceylon. Up to the present results have been very promising, types yielding up to 7 candies of copra per acre as compared with the usual output of 2 or 3 candies having been isolated. The extent to which such high yield is inherited is to be tested by progeny tests with selected mother palms which will be closely studied for performance and other characters.

In Ceylon apparently most plantations comprise only a few varieties and in general the tall forms, corresponding perhaps to the Laguna type grown in the Philippines, predominate and in most cases are almost exclusively grown. It will therefore be necessary to make a study of the numerous varieties of coconuts in relation to their economic importance and this work has already been begun.

Biometrical studies of the coconut palm have also been made (see "Plant Breeding Abstracts," Vol. IV, Abst. 887) and germination has been investigated to test the traditional ideas on seed-nut selection and general nursery technique. A study of the root system is contemplated as a joint task of the genetics and soil chemistry sections.

263. DOWSON, H. V. W. 634.62:575.255
Chimera in dates.
 Trop. Agriculture, Trin. 1934 : 11 : p. 209.

A sectorial chimæra of the fruit is described and appears to be the first recorded case of the phenomenon in dates.

264. LARTER, L. N. H. 634.771:575.252:576.16
Sports of the Gros Michel.
 J. Jamaica Agric. Soc. 1934 : 38 : 461-65.

The typical Gros Michel plant is described, and the distinguishing characters of six sub-varieties or sports discovered during the last 10 years are summarized as an aid to identification in the field. All six are susceptible to Panama Disease. Some are commercially inferior to the typical Gros Michel ; one at least is superior in some respects.

It is not impossible that a strain resistant or immune to Panama Disease may some day appear as these variants have done.

VEGETABLES 635

265.

LEVAN, A.

635.265:576.356:575.114

635.265:576.356:576.356.5

Distribution of chromosome numbers in a progeny of triploid *Allium Schoenoprasum*.

Nature 1934 : 134 : p. 254.

A cross between a tetraploid giant form of *A. Schoenoprasum* L. ($2n = 32$) and common diploid chive ($2n = 16$) gave a triploid F_1 ($2n = 24$) all completely self-sterile. Of the F_2 , which was mainly derived from crosses within the triploid material, 620 plants were examined and all chromosome numbers between 16 and 34 except the number 20 were found ; three plants had 38, 39 and 45 chromosomes respectively. The average of the entire F_2 generation was $2n = 29$; the numerically highest class represented was $2n = 30$ with 185 individuals or 29.8 per cent of the whole progeny ; the classes $2n = 29-31$ amounted to 65.8 per cent, while plants with less than 24 chromosomes numbered only 6.7 per cent. The euploid numbers were formed with the following frequency : diploid in 7 cases, triploid in 21 cases and tetraploid in 38 cases. There were 9 trisomic plants.

Observations on the first pollen division in triploids shew that all numbers between 8 and 16 occur, 12 being commonest. The distribution of chromosome numbers in F_2 should therefore be due to zygotic selection. Zygotes in which $2n$ is about 30 are the most easily formed and those in which $2n$ is about 20 the most difficult.

The few plants with over 32 chromosomes originate from gametes with doubled chromosome numbers or possibly in the case of 33 and 34 chromosomes from non-disjunction.

266.

SUBBIAH PILLAI, M.

635.64:575.125

Heterosis in tomatoes.

Madras Agric. J. 1934 : 22 : 254-55.

The advantageous effect of heterosis on yield and earliness was demonstrated by the crosses Ponderosa x Earliana and Potato leaf x Ponderosa. The same Ponderosa plant was used in both crosses. Though the number of plants observed was small it was evident that the F_1 's matured earlier than the earlier parent, the size of the fruits was intermediate and the hybrids yielded 20-30 per cent more than the female parent plants.

The crosses are being repeated with larger numbers of F_1 's.

The process is recommended to tomato growers.

267.

KEY, K. M.

635.64:576.356.5:577.16

The determination of vitamin C in diploid and tetraploid tomatoes.

Bio-Chem. J. 1933 : 27 : 153-56.

The fact that there appears to be no difference between the vitamin C contents of diploid and tetraploid tomatoes of the same genetic constitution indicates that the number of chromosomes is not the sole factor controlling the vitamin C content.

Part II. Foreign.

STATISTICS 519

268. BIGOT, A. 519.24
De toepassing van "Analysis of variance" bij proefvelden. (The application of "Analysis of variance" in field experiments.)
Landbouwk. Tijdschr. Wageningen 1934 : 46 : 640-52, 705-17.

The article discusses and sets out in algebraical and arithmetical detail the principles of the "Analysis of variance" technique as elaborated by R. A. Fisher. With an eye to the fact that nothing on this subject has been published in the Netherlands, the author begins with the elementary principles of field experimentation and step by step introduces complications, with detailed explanations as to how the "Analysis of variance" may be used and modified to deal with all cases.

At the outset, he discusses how experimental data may be best represented by two statistical values, the mean, and the standard deviation, which latter is a measure of the variation in the results, due to (a) chance and (b) systematic causes; and gradually he develops an explanation of the "Analysis of variance" which enables one to split the total variation in the results into component parts. These component parts may be many or few, depending on the complexity of the treatments and layout of an experiment, but always there emerges that part which is due neither to systematic soil variation as represented by blocks, nor to treatment variation but which is an expression of true random error variation after these others have been eliminated. The test of significance by *Z* is shewn to be simply a test of whether these other parts of the variance are significantly greater than the error variation.

The principles and requirements of the randomized block type of experiment are set out with full calculations from an actual example.

G. B. L.

269. LIVERMORE, J. R. 519.24
The interrelations of various probability tables and a modification of Student's probability table for the argument "t."
J. Amer. Soc. Agron. 1934 : 26 : 665-73.

By shewing that the many tables in general use for estimating statistical significance are connected by rigid relationships and may be readily classified, the author attempts to remove some of the confusion that may exist among research workers concerning the proper table to consult. Whether classified into two main groups—"one-tailed" and "two-tailed" tables, or according to the method of tabulation or depending on the type of curve that was integrated to furnish the probability values, all should yield compatible results when interpreted correctly.

Students' table for "t," described in his paper, "New tables for testing the significance of observations: Metron 1925 : 5(3) : 18-21" and regarded as being so complete that it may be used in place of all the other tables mentioned, is reproduced in modified form so that it may be read in terms of odds instead of probabilities. Numerous examples are given illustrating the use of this modified table in comparison with the other tables.

G. B. L.

GENETICS 575

270. GAUMANN, E. 575(43)
Der gegenwärtige Stand botanischer Forschung in Zürich. (The present position of botanical research in Zürich.)
Vjschr. naturf. Ges. Zürich 1934 : 79 : 83-154.

The work of five institutes engaged in botanical research is briefly reviewed for the period 1930-1934. The results of published work are described and the objects of present researches are mentioned.

In the section devoted to plant breeding, work on heterostyly in *Primula* is described and the results of researches on the pollination of stone and pome fruits are given. Work on vine breeding is in progress and in wheat breeding the aim is to increase yield without diminishing the quality of the flour.

271. TSCHERMAK-SEYSENEGG, E. 575.129
Über nichtspaltende fruchtbare Artbastarde. (**On constant fertile species hybrids.**)

Forsch. Fortschr. dtsch. Wiss. 1934 : 10 : p. 49.

The differences between the hybrids which segregate according to Mendel's laws and the "additive hybrids" of the author are briefly discussed and a number of cases of such hybrids are mentioned.

272. SCHKWARNIKOW, P. K. and NAWASCHIN, M. S. 575.24:581.036
Über die Beschleunigung des Mutationsvorganges in ruhenden Samen unter dem Einfluss von Temperaturerhöhung. (**On the acceleration of the mutation process in resting seeds under the influence of increased temperature.**)

Planta (Berl.) 1934 : 22 : 720-36.

A fuller and illustrated account of the work previously reviewed in "Plant Breeding Abstracts" Vo. IV, Abst. 1.

273. DEMIDOVIC, A. 575.242:581.01:633.491
(**A new possibility in breeding.**)

Semenovodstvo (Seed Growing) 1934 : 4 : 8-10.

From crosses of a number of potato varieties *inter se* and with wild species, seed was obtained in 1928. Some of this seed was sown in the following season, part of it was retained at room temperature for five years and sown in 1932. A large proportion of mutants appeared amongst the seedlings from the older seed; these proved to be both chromosomal and gene mutations, some of which were characterized by very high productivity and are now included in the variety tests. The author claims that this method is more effective than X-rays and other artificial agencies for inducing mutations and is certainly much cheaper.

274. SAPEHIN, A. A. 575.243:537.531:633.11
(**X-ray mutations as a source of new varieties of agricultural plants.**)

Priroda (Nature) 1934 : No. 9 : 28-31.

The author's experiments on wheat have shewn that each variety reacts in its own particular way to X-ray treatment, different varieties giving different types of segregating populations.

Soft spring wheats give a great variety of mutants in their X-rayed progeny, *Triticum durum* on the other hand tends to give a large number of mutants but of a limited number of types, such as forms with soft glumes, extended glume tooth, small or elongated glumes. The winter varieties of soft wheat give a large proportion of heterozygous speltoids, while again the proportion and types of speltoids varies according to variety; from 12 per cent to 55 per cent appeared in the progeny of different varieties.

The chromosomal mutants are mostly sterile or partially sterile and tend to disappear in later generations. The gene mutations are permanent, however, and can be fixed if desired. In the case of vegetatively propagated plants even the chromosomal mutants can be perpetuated and may thus be a source of valuable new forms.

275. GOODSPEED, T. H. 575.243:576.356:537.531
Chromosomal alterations induced in plants by X-radiation.

Amer. Nat. 1934 : 68 : p. 466.

Chromosomal alterations induced by X-ray radiation differ in frequency of occurrence rather than in kind from those found in nature. In general the various types of alterations produced and their cytogenetic significance can be illustrated by the results of X-ray treatment of *Nicotiana*.

276. HALDANE, J. B. S. 575.42:575.114:519
**A mathematical theory of natural and artificial selection. Part X.
Some theorems on artificial selection.**

Genetics 1934 : 19 : 412-29.

Formulae are presented which give the nature of the populations resulting in successive generations on selecting or eliminating multiple recessives and multiple dominants with respect to a character dependent upon a number of complementary genes, each pair being present in the same ratio. The formulae are given for random mating, self-fertilization and brother-sister mating.

EVOLUTION 576.12

277. CONKLIN, E. G. 576.12
Penrose memorial lecture. A generation's progress in the study of evolution.

Proc. Amer. Phil. Soc. 1934 : 74 : 137-58.

Some of the steps in the recent progress towards a solution of the problems of evolution are briefly reviewed with special reference to mutations and the origin of new species through polyploidy.

The extension of the principle of selection by which the organism has the power of selection and differentiation, suggested by the author in explanation of adaptations, is discussed.

278. BABCOCK, E. B. 576.12:576.356
Genetic evolutionary processes.

Proc. Nat. Acad. Sci. Wash. 1934 : 20 : 510-15.

The various types of genetic change which have played a role in the evolution of groups of organisms can be to some extent elucidated by a study of the organisms themselves, apart from changes experimentally induced.

On the basis of a 20 years study of the genus *Crepis* the author concludes that the genetic processes of evolution in this plant in order of their relative importance are :—(1) chromosome transformation (usually termed translocation) allowing of either an increase or a decrease in the number of chromosome pairs ; (2) interspecific hybridization followed either by amphidiploidy or by back-crossing on the parent species or crossing on a new species ; (3) polyploidy ; (4) gene or point mutation, superimposed upon and operating concurrently with the first three processes. A hypothesis is also outlined of the basic processes concerned in the evolution of the *Crepidinae*.

Finally the general significance of the foregoing conclusions and hypothesis is made clear, emphasis being laid on the fact that several kinds of genetic changes are of more importance in the evolution of *Crepis* than gene mutation. The latter process is, however, undoubtedly an essential element in sub-specific and specific differentiation, since it provides the Mendelian differences for natural selection to work upon for the establishment of ecotypes, geographical races, sub-species and species with the same type of genome as the species from which they have developed.

To what extent a mathematical theory of natural selection such as Fisher's, Wright's and Haldane's can be applied to the results of these categories of genetic change, other than single gene differences, remains to be discovered, just as the relative importance of chromosomal transformation as compared with gene mutation in the evolution of genera, families and orders of plants and animals still awaits elucidation.

CYTOLOGY 576.3

279. EICHHORN, A. 576.312.3
Types définis et types intermédiaires dans la mitose des végétaux. 576.353
and intermediate types in the mitosis of plants.) (Definite
Cytologia 1934 : 5 : 253-68.

The two definite types of resting nucleus (a), with a simple network and (b) without a network but shewing the presence of "prochromosomes" and the two intermediate types, a reticulated nucleus with chromocentra and non-reticulated also with chromocentra are described and an account is given of their behaviour at prophase and telophase and also of metaphase in conifers, which represent the first intermediate type.

280. SCHLÖSSER, L. A. 576.356.5:581.162.5:581.163
Zur Frage der Genomstabilisierung bei Heteroploiden. (On the question
of genom stabilization in heteroploids.)
Biol. Zbl. 1934 : 54 : 436-45.

The experiments were carried out on a homozygous strain of a wild *Solanum Lycopersicum* and its auto-tetraploid. On transferring the plants from a temperature of 17-19° C to -1° C for five minutes very little change was brought about in the egg cells and in the diploids,

whereas the pollen development in the tetraploid was very much disturbed, the percentage of good pollen being reduced from 88 to 37. In the progeny of a tetraploid plant treated with such pollen, 23 normal plants with the normal tetraploid number 48 occurred, together with one plant with 52 chromosomes. This plant differed from diploids in the same respects as did the tetraploid but to a more pronounced degree. Its growth was stunted, and it failed to form fertile flowers, the buds being invariably shed at an early date. However, when cuttings were taken from this plant the buds developed slightly further; later generations of cuttings developed successively more, so that the fourth vegetative generation came almost to anthesis, normal flowers were produced in the fifth generation, though 80 per cent of the pollen was abortive, and in the seventh only 35 per cent abortive pollen was observed. The reduction division, which was at first highly irregular, became more regular in succeeding generations. Fruits, often with the normal number of seeds, were set in the ninth vegetative generation, at which stage the plants mostly had normal chromosome behaviour and formed gametes with 24 chromosomes, the extra four being lost in the first reduction division.

The chromosome number in the root tips was counted in each generation and remained constant at 52.

Repeated vegetative reproduction from cuttings has also been found to increase the fertility of ordinary tetraploid tomatoes until it finally equals that of the diploid. The relationships between the genes and the basal structure of the organism are changed in the polyploid and heteroploid individuals and it is suggested that a lapse of time results in the adaptation of the genes to the new medium, in which at first some of them failed to function or functioned abnormally.

BOTANY 581

281.

581.035:575

HACKBARTH, J.

633.491:576.16:581.143.26.035.1

Die Bedeutung von Tag- und Nachtrhythmus (Photoperiodismus) für die Pflanzenzüchtung. [**The importance of day and night rhythm (Photoperiodism) for plant breeding**].

Naturwissenschaften 1934 : 38 : 646-47

Many of the South American potato species which in their natural habitat develop abundant tubers, in Germany almost or entirely failed to do so, forming on the other hand stolons of excessive length. The specimens that behaved so proved to be those from the equatorial regions as shewn by observations of 60 different clones from varying latitudes from 0° to 45°. The photoperiodic reaction appears to be genetically conditioned, as has been shewn to be the case in certain other plants (see "Plant Breeding Abstracts," Vol. IV, Abst. 1039). Hybridizations have been made between potatoes of long and short photoperiod to study the inheritance of the phenomenon.

Treatment with chemicals has so far failed to alter the photoperiodic reaction but application of the principles of vernalization is likely to change the situation materially. The vegetative vigour of short-day plants grown in the long-day areas can probably be put to practical use in the case of fodder plants.

282.

BOEKHOLT, K.

581.1:575

Physiologie und Pflanzenzüchtung. (**Physiology and plant breeding**.)

Züchter 1934 : 6 : 149-52.

The importance of a knowledge of the action of physiological as well as genetical factors for the plant breeder is pointed out. Studies have already been made on the effects of moisture and temperature and therefore special attention is here paid to the influence of light on the development of some crop plants.

It is well known that plants can be divided into long-day, short-day and ever blooming types and that alterations in their development can be induced by changes in the amount of light they receive. Varying the time of sowing, cultivation at different latitudes or cultivation under artificially regulated light or darkness all offer possibilities to the plant breeder.

With regard to differences in time of sowing, strains of the same species shew considerable differences in their behaviour, some shewing a marked decrease in yield as the time of sowing is retarded. The more definitely a plant is a long-day plant the more suitable it is to later

time of sowing. This is true in spring wheat of the varieties Janetzki and Heines Kolben and in oats of the Hohenheimer V. variety.

The practical advantage of a knowledge of the light reaction of plants is clearly shewn in the case of lupins when by late sowing of the shortest day strains the maximum yield of green fodder is obtained.

Another most important factor to be considered is spacing. The optimum spacing is a varietal character and shews wide variations.

Estimations of yield based only on the performance of the ears of individual plants are bound to be inaccurate and the performance of the plants as a population must be taken into account. The reason for the different spacing required by species and varieties of cereals is to be found in the varying components which go to make up their yield. The requirements of each strain in this respect must be studied if the best results are to be obtained.

The spacing of fodder plants in particular would repay detailed investigation and a closer co-operation between physiological and genetical studies is much to be desired.

283. FEISTRITZER, W. 581.143.26.03
 Die Jarovisation landwirtschaftlicher Kulturpflanzen. (**The vernalization of agricultural crop plants.**)
 Züchter 1934 : 6 : 153-55.

The principles of vernalization are briefly discussed.

It has been found that the varieties vary in the degree of temperature required. For most German winter wheats, for instance, a temperature of $+3$ to $+8^{\circ}\text{C}$. is sufficiently low for a period not less than four weeks and with the addition of 30 per cent of water to the treated collection of grain. For winter barley temperatures between $+3$ and $+10$ suffice but the time for treatment is shorter. For the prevention of mildew on the seed of short day plants during treatment, steeping the seed in a 0.1 per cent solution of corrosive sublimate for 10-15 minutes is advised before vernalization.

How far the use of vernalization in Germany can be extended has yet to be investigated. Certainly by this method winter cereals can be sown in the spring and maize shews a much increased and more vigorous sprouting. The results on soya beans are not yet conclusive and it remains to be seen whether the method will make it possible for Germany to be independent of such imports as maize, soya beans and cotton, etc.

284. MUNERATI, O. 581.143.26.03
 Il pre-trattamento delle sementi secondo il metodo Lyssenko. (**The pre-treatment of seed according to Lyssenko's method.**)
 G. Agric. Domen. 1934 : 44 : p. 245.

Some recent results in America are discussed and also very early work which shewed that the fundamental idea of vernalization was not new.

Of four varieties of wheat tested in Italy only one, Inallettibile Vilmorin, responded successfully to the treatment. The plants from the treated seed were more susceptible to rust than the controls.

It is suggested that the climate of Italy is not favourable for the treatment and further investigations are needed to explain the differences observed between varieties in their response.

285. LITVINOV, L. S. 581.143.26.03:635.655
 (**On the mechanism of yarovization of soybean.**)
 Bull. Inst. Rech. biol. Perm 1934 : 9 : 59-70.

A variety of soya beans known to react markedly to vernalization was taken and caps put over the growing points of the experimental plants as soon as they emerged, leaving the leaves free to the light. Controls were grown in the same pots without caps. After three days the caps were removed for two days to allow the growing point to unfold and then replaced on the main growing points for three more days, removed for two days and so on. Later the growing points in the axils of the leaves were also covered. In neither case was any difference in time of flowering between experimental and control plants observed. This indicates that for vernalization it is not enough to treat the growing point alone and that vernalization is a phenomenon in which the entire plant is influenced.

286. VEH, R. von 581.162.5
Über Fruchtbarkeit und Unfruchtbarkeit bei höheren Pflanzen. (On fertility and infertility in higher plants.)
Ber. dtsch. bot. Ges. 1934 : 52 : 407-16.

The author's main thesis (see "Plant Breeding Abstracts," Vol. IV, Absts. 750 and 1081) that in order to discover the causes of infertility, above all a knowledge of the conditions necessary for fertility is essential, is again presented from the developmental and ontogenetic standpoint. Special emphasis is laid on Goebel's views on polarity in the inflorescence and on Oelker's survey of the causes of infertility in the higher plants.

287. McNAIR, J. B. 581.192:576.16
The evolutionary status of plant families in relation to some chemical properties.
Amer. J. Bot. 1934 : 21 : 427-52.

Analyses of some 318 fats, 232 waxes, 938 volatile oils and 299 alkaloids from 83, 84, 87 and 57 plant families respectively are held to demonstrate "what may be a general rule for the tropics and perhaps for all climates—that the more highly organized the plant the more highly organized are likely to be its chemical products."
A bibliography is appended.

PLANT DISEASES 632

288. TOGASHI, K. and SHIBASAKI, Y. 632.411.4:576.16:633.42
Biometrical and biological studies of *Albugo candida* (Pers.) O. Kuntz in connection with its specialization.
Bull. Imp. Coll. Agric. For. Morioka 1934 : No. 18 : Pp. 88.

An investigation of morphological and biological specialization within *A. candida* shewed this species to comprise two morphological forms, one reproduced by the fungi on *Brassica* and *Raphanus* and the other by those on *Cardamine*, *Capsella*, *Draba* and *Arabis* species. Taxonomically these forms are regarded as representing two varieties, one called *A. candida microspora* and *A. candida macrospora*; the first of these comprises three biological forms and the second two such forms.

289. 632.452:576.16:575.12
STAKMAN, E. C., LEVINE, M. N., COTTER, R. U. and HINES, L.
Relation of barberry to the origin and persistence of physiologic forms of *Puccinia graminis*.
J. Agric. Res. 1934 : 48 : 953-69.

The data obtained indicate clearly that not only do barberry bushes produce abundant inoculum but their presence enables new physiological forms to arise through hybridization and they promote the persistence and multiplication of existing forms.

ECONOMIC PLANTS 633

290. 633.576.312.35
OPPENHEIMER, H. C.
Kultur-pflanzen : Name, Heimat, Nutzung, Chromosomen-Zahl, botanische und technische Charakteristika. (Cultivated plants : their name, home, use, chromosome number, botanical and technical characteristics.)
Tabul. biol. Berl. 1934 : 3 : 349-94.

A series of tables giving information on all the plants deemed of cultural value in Europe and North America, with the exception of medicinal plants, forest plants and spices. The scientific name according to Zander's botanisches Handwörterbuch, the meaning and origin of the name, the German, English and French equivalents, the native habitat or supposed origin, the date of taking into cultivation, the centre of the present cultivation, the part or parts of the plant used and the form in which they are used, and finally the chromosome number are tabulated. There is an index of plants arranged according to their mode of utilization.

291. **MAKSIMOV, N. A.** 633:575:578.082
 (The use of artificial illumination for accelerating breeding work.)
 Semenovodstvo (Seed Growing) 1934 : 4 : 16-19.

In using greenhouses with artificial illumination it has been found that although the light of a half-watt lamp is very suitable for photosynthesis, the blue-violet rays are necessary to prevent etiolation phenomena and to bring about the formation of many nitrogenous compounds and of vitamins. To overcome this difficulty every possible ray of daylight must be utilized and an attempt must be made to find some suitable source of blue-violet rays, as no altogether satisfactory source at present exists.

Plants vary in their particular light requirements and any breeder wishing to use artificial light treatment should first get the advice of a competent plant physiologist. There is a special laboratory for this purpose in the U.S.S.R.

292. **WARNER, M. F., SHERMAN, M. A. and COLVIN, E. M.** 633:575.1(016)
 A bibliography of plant genetics.
 Misc. Publ. U.S. Dep. Agric. 1934 : No. 164 : Pp. 552.

This bibliography which has been compiled from the library catalogue of the Bureau of Plant Industry and to some extent from other sources contains 10,156 references.

The work is intended to provide those who have inadequate library facilities with the background of the literature of plant breeding and would appear to fulfil this task adequately. The scope of the literature represented is wide and comprehensive, though not, it is stated, exhaustive. Publications for 1930 are included as far as possible. Japanese and Russian works are given only when accompanied by summaries in other languages. There is a subject index and an author index giving full names: papers containing bibliographies are starred.

293. **GHIMPU, V.** 633:576.312.35
 Les nombres chromosomiques de quelques angiospermes cultivées. (The chromosome numbers of several cultivated angiosperms.)
 C.R. Soc. Biol. Paris 1933 : 112 : 1115-17.

Brief findings are given on the chromosome number and occasionally also data on certain cytological characteristics of the following cultivated plants:—*Papaver somniferum* ($2n = 20$), Soya bean ($2n = 38$), *Arachis hypogaea* and *A. prostrata* ($2n = c. 40$), *Ricinus communis* ($2n = 20$), *Nicotiana glauca* var. *grandiflora* ($n = 9$), *N. angustifolia crispa* ($2n = 22$), *N. commutata* ($2n = 16$), *N. plumbaginifolia* ($2n = 20$), *N. quadrivalis* ($2n = 48$), *N. tabacum* ($2n = 24$). *Sorghum sudanensis*, *S. exiguum*, *Andropogon Sorghum* var. *sudanensis* are all recorded as having 20 chromosomes diploid.

It was possible to distinguish accurately Sudan grass by its chromosome number from *S. halepensis* in which $2n = 40$.

294. **KOSTOFF, D.** 633-2-1.521.6:575
 Inheritance of natural immunity in plants with special reference to breeding of immune varieties.
 Z. Zücht. 1934 : A 19 : 550-76.

Supported by a bibliography of eight pages, an outline of the present state of genetic research on natural immunity in plants is presented with a summary of the work that has been done on the nature of plant immunity, environmental factors affecting resistance and on pathogens and their possible genetic nature.

295. 633.00.14:578.08
 (The State Variety Testing Service. Collection of information and methods No. 6.)

Lenin Acad. Agric. Sci., Inst. Pl. Ind. Leningrad, 1934 : Pp. 67.

A manual containing full instructions for the carrying out of varietal tests, the determination of quality in various types of crops and of resistance to fungous and insect pests. Brief chapters are also accorded to the statistical treatment of the results and to the method and results of growing potatoes from seed.

**(Principles of the organization and methods of plant breeding. I.
Grain crops.)**

Suppl. 66 Bull. Appl. Bot. Leningrad 1934 : Pp. 118.

A manual on breeding methods applied to grain crops and pulses. The main objects of breeding these plants in the Soviet Union are outlined, after which comprehensive schemes are presented in illustration of the method of carrying out the various processes such as individual plant selection, mass selection etc., etc., in natural and in hybrid populations, for cross and self-fertilized plants. Among these the method of "halves" figures, where one half of the population is grown under field conditions and serves for comparison with the standard and the other half is sown under controlled conditions to supply seed.

Detailed directions are given for the points to be taken into consideration in making selections, with indications of the stage at which each point should be taken into account for the various crops. Methods of speeding up the breeding work are enumerated and discussed.

There follows a series of chapters devoted to each crop in turn, where the problems facing the Soviet breeder and the material available for the solution of these problems are fully discussed, together with the special methods to be adopted in breeding for each particular object and the nature of the treatment to be afforded to the material at each stage of the breeding operations. Spring and winter wheat, rye, barley, oats, peas, beans, vetches and lupins are treated in this way.

An outline is given of Lyssenko's method of vernalization and it is recommended that all breeding material should be vernalized and grown under conditions of continuous illumination: only in this way can the full variation between the different lines be manifested and the true qualities of the parental varieties be correctly estimated. Under these conditions the relative earliness, yield, etc., of the varieties is often quite changed and even reversed. The yields of many varieties are made to exceed the standard varieties by this treatment; some respond to the vernalization, shewing that the first developmental stage is the limiting factor, and some to the continuous light, the second developmental stage being the limiting factor in this case. By choosing one parent of each of these two types it is hoped to find segregates which require neither one nor the other of the two treatments but develop naturally under the local conditions both in the first and second developmental phases. To achieve this the choice of parental varieties can only be made in the locality which the breeding work is designed to serve and when as wide a range of types as possible is available. This in itself is made possible only by the application of vernalization, which also enlarges the range of possible parental combinations and often permits of the production of two and more generations in one year.

Instructions are given for carrying out vernalization on small samples such as are used in plant breeding and a table is provided shewing the conditions required for vernalization of the main types of wheat and other crops, the requisite time, moisture, temperature and other conditions being indicated.

Directions are also given for the greenhouse cultivation of cereals and other plants not commonly grown under glass and requiring certain special measures, and for the carrying out of observations on the developmental phases of the plant and on resistance to lodging, shedding, frost, drought and fungous diseases; also on the determination of milling and baking quality and of the chemical constituents of the plant.

OSTERMAYER, A.

Pflanzenzüchtung auf Widerstandsfähigkeit gegen Trockenperioden. (Plant breeding for resistance to periods of drought).

Züchter 1934 : 6 : 155-62.

Various causes for the differences in drought resistance observed in cereals have been suggested but very little attention has been paid to the importance of the root system in this respect and from the point of view of the breeder. This is partly due to the practical difficulty of making accurate observations, but as in breeding only analytical methods need be considered, a practical

method is described. The observations recorded in the present paper are the result of 20 years work, a period of 8 years preparation and of 12 years testing on varieties of oats. A comparison of oat populations which had a good and a medium resistance to drought shewed that the greater development of the parts of the plant above ground went with a greater development of the root mass. It was further found that the roots of the more resistant plant penetrated deeper into the soil and therefore were able to make use of the higher moisture content of the lower layers of soil.

The morphological characters most important for the intake of water, of a large number of the best developed plants from fertile, medium or poor soils were compared. The development of the organs above ground rises and falls with the degree of fertility of the soil and also represents a function of the root mass whose amount also rises and falls with the quality of the soil. The poorer the soil the greater is the proportion of the deep growing roots to the plant organs above ground.

The question whether this character was transmitted to the progeny was next investigated. The progeny of the best, medium and poorly developed plants were subjected to 12 year tests and the results shewed that the plants which were least susceptible to drought transmitted their resistance to their progeny. It was further established that the progeny of drought resistant plants shewed an absolute increase in root development as well as a relative increase compared with the growth of the parts above ground and that the development is most marked in the parts growing in the deeper and more moist layers of the soil. It is therefore possible to isolate strains which are capable of adapting themselves to conditions of drought. The difficulty, however, for the plant breeder lies in the lack of an entirely satisfactory method for the determination of this morphological character.

298. GASSNER, G. and STRAIB, W. 633.1-2.452 *P. glumarum* : 576.16
 Weitere Untersuchungen über biologische Rassen und über die Spezialisierungs-
 verhältnisse des Gelbrostes *Puccinia glumarum* (Schm., Erikss. und Henn.).
 [Further investigations on biological races and on specialization in
 yellow rust *P. glumarum* (Schm., Erikss. and Henn.).
 Arb. biol. Reich. Land.-u. Forstw. 1934 : 21 : 121-45.]

Using their previous technique (see "Plant Breeding Abstracts," Vol. III, Abst. 362 and Vol. V, Abst. 335.) ninety-five samples of yellow rust obtained in 1933 from various parts of Germany and other European countries were tested and 18 different races of yellow rust identified. Of these five were new, one being from Germany and the rest from other countries.

In addition to the relationship previously found between race distribution and the host variety in cultivation, the present findings indicate the importance in distribution studies of allowing also for the interactions between climatic factors and resistance behaviour.

Geographical distribution studies are still in the early stages and it is perhaps significant that in the few samples received from Turkey, Bulgaria and Finland four new races were discovered. A series of experiments by the writers on the behaviour of yellow rust races on barley, couch grass, rye and *Elymus* are held to refute Eriksson's theory of *formae speciales* or biological species as defined by him and Klebahn.

WHEAT 633.11

299. 633.11 Guatraché, M. A.
 633.11:575.42(82)
 La nueva variedad de trigo de invierno, Guatraché M. A. (Nieves). [The new
 variety of winter wheat Guatraché M. A. (Nieves)].
 Circ. Minist. Agric. B. Aires. No. 1 : Pp. 11.

A description of a new wheat produced by eight years of selection from the original Kansas, each year only those plants which proved superior to Kanred being selected. Yield and resistance to yellow rust, to cold and to strong sun were the principal factors in making the selections and the final decision was made on the score of milling and baking quality. Though slightly less resistant than Kanred it outyields this variety considerably and is rapidly replacing it. It is markedly superior to Kanred, and sometimes even to Lin Calel, in baking quality, in which respect it is equal to Manitoba Northern and Hard. No. 1.

300. PESOLA, V. A. 633.11 Pohjola
633.11-1.524.4

Maatiaisyyssvehnään kohdistuneesta jalostustyöstä ja sen tuloksista. (The Finnish native winter wheat as breeding material.)

Maataloust. Aikakausk. (J. Sci. Agric. Soc. Finland) 1933 : 5 : 97-107

Pohjola wheat is a pure line of a south Finnish native variety isolated by the writer. The ear is white and pubescent without awns, the straw of medium length, the grain reddish, of medium size and rather hard, with a 1000 corn weight of 30-35g. Compared with a number of other strains and varieties the winter hardiness of Pohjola was exceedingly good and it seems possible that owing to this characteristic and its earliness the northern limit of cultivation might be extended by about 200-250 km. The straw of Pohjola is not very stiff and resistance to stripe rust not particularly good.

301. NAVOLOTSKII, N. M. and NAVOLOTSKII, A. V. 633.11 *T. durum* : 575

(Methods of creating hard wheat for the north.)

Semenovodstvo (Seed Growing) 1934 : 4 : 14-16.

Triticum persicum, which like *T. durum* has 28 chromosomes, is in nearly all its characters like *T. vulgare*, with which it was always placed before the discovery of its chromosome number. Among its other qualities are pronounced resistance to mildew, rust and other diseases, frost resistance and tolerance of unfavourable soil conditions. The authors are convinced therefore that it is more profitable to improve *T. durum* by crossing it with *T. persicum* and *T. dicoccum* than by engaging in crosses with *T. vulgare* or other species with different chromosome number.

302. LONG, J. 633.11:575(44)
633.11:575.243

Etude sur les blés au Centre national d'expérimentation du Midi, Le Merle, par Salon (B.-du-Rh.). (Campagne 1930-31.) [Study on wheats at the Centre national d'expérimentation du Midi, Le Merle, par Salon (B.-du-Rh.). (Year 1930-31.)]

Bull. Off. Agric. Midi. 1934 : No. 51 : 187-211.

(Campagne 1931-32).

(Year 1931-32)

Bull. Off. Agric. Midi. 1934 : No. 52 : 267-93.

Two reports dealing with the work of the above station, which includes (a) large scale variety tests ; (b) the study of hybrids obtained from the agricultural department of the Bouches du Rhône, dealing in the first place with the various lines and in the second with numbers in process of multiplication ; (c) new crossings ; (d) the isolation and study of new Tuzelle lines ; (e) the production of mutations by crossing Tuzelle varieties and by continued exposure to light.

Detailed descriptions of the various hybrids, new crosses, etc. are given with notes on the progress made.

303. 633.11:575(47)
633.11-1.524.4(47)

(The northern wheat base of the U.S.S.R.)

Lenin Acad. Agric. Sci. Inst. Pl. Ind. Leningrad 1934 : Pp. 206.

A collective work consisting of articles by various authors on different aspects of one of the biggest problems in Soviet agriculture, the extension of wheat cultivation northward. The following articles may be of interest to plant breeders :—

(1) M.G. Prutskova "The best wheat selections for the northern, non-black-soil zone."—Reference is made to the demonstration by the state variety testing service that, in spite of popular opinion, wheats of good quality are capable of growing in the region in question. Descriptions are given of a number of the most successful selections, with indications of their mode of origin and an account of their performance under northern conditions and the quality of the grain produced. Two charts are given shewing the zones of possible cultivation of the different varieties of winter and spring wheats respectively.

(2) K.A. Flaksberger "On the local wheats."—It is pointed out how many of the most successful

new North American wheats have been produced from crosses of common local Russian wheats, the characteristics of a considerable number of which are briefly mentioned. It is recommended that these local wheats, many of which have been cultivated for centuries, should receive further study and be put to more use than has been the case in Russia in the past. In a further article the same author describes an expedition undertaken with the object of studying the local wheats in the province of Leningrad. The main characteristic of the wheats found is that they are extremely early and require very little heat during the ripening period; many of them are capable of giving quite high yields of grain which, though small, is of good quality.

Tables are given recording the wheat yields at different points in the province every year from 1895 to 1914.

304. PAL'MOVA, E. F. and BASOVA, A. P. 633.11:575"793"
(**Breeding wheat for earliness.**)

Semenovodstvo (Seed Growing) 1934 : 4 : 10-13.

The world collection of wheats shews very clearly that early maturing wheats are to be found in four main regions, the arctic, the continental regions of the sub-tropics, mountain regions and the countries of periodic rains such as China and Japan.

In other respects the wheats of these four groups are very different in type. The northern forms have a low heat requirement and a pronounced reaction to light, the southern forms are tolerant of high temperatures and do not react to light. These groups, moreover, behave differently in inheritance, the earliness of the southern early forms (from India, Australia, Syria, etc.) is dominant and transmitted to nearly the whole of the progeny, whereas the earliness of the steppe wheats is sometimes dominant and sometimes recessive. These differences are dictated by the variation in light requirements of the different types. The southern forms do not react to light because they have a low light requirement; yet their sensitivity to light is said to be as pronounced as that of the northern forms. By crossing these two extreme types, forms with varying light requirements will arise, and so forms varying in earliness.

305. STRAMPELLI, N. 633.11:575"793"(45)
633.11:575(45)
Early ripening wheats and the advance of Italian wheat cultivation.

Rome 1933 : Pp. 26.

The revolution effected in the cultivation of wheat in Italy by the use of the high-yielding and early maturing wheats bred by the author is briefly outlined.

Baking quality and resistance to diseases, especially "blast," have not been neglected in the creation of these new varieties which also include *durum* forms. The ears of these varieties are illustrated in colour and maps are given shewing the increased use of the Strampelli wheat throughout Italy.

306. SĂULESCU, N. 633.11:575.11
Contribuțiuni la genetica grâului. (**Contributions to the genetics of wheat. I.**)

Bul. Acad. Agron. Cluj 1933 : 4 : 11-33.

The first part of a genetical study of the inheritance of a number of characters in wheat crosses. The results on awns, pubescence of the glumes and glume colour are here reported.

In the F_2 awnlessness was dominant and the hybrids segregated in a simple 3 : 1 ratio. F_3 however shewed more complicated segregation and four linked, cumulative factors are assumed. Pubescence of the glumes and red colour of the glumes both shewed a single factor inheritance.

307. 633.11:575.12:664.641.016

GOULDEN, C. H., GEDDES, W. F. and WHITESIDE, A. G. O.

A study of carotene content and other quality characters in a series of hybrid wheats.

Cereal Chem. 1934 : 11 : 557-66.

In view of the technical difficulties confronting the plant breeder aiming at new varieties of wheat that will yield flour of low carotin content, the present preliminary work was done

to determine exactly in a group of new varieties the relation between the carotin content of the flour and that of the whole wheat.

The wheats used consisted of 139 miscellaneous and new hybrid strains including a group of 48 strains from one cross, H-44-24 x Marquis.

In considering the results of this tentative investigation the necessity in such studies of allowing for effects of genetic linkage is mentioned.

It appeared that whole wheat tests for carotin might be of considerable value in breeding work if applied as a basis for selection in the early generations and continued in the progeny for two or three years.

308. OEHLER, E. 633.11:575.127

Die Ausnutzung von Art- und Gattungsbastarden in der Weizenzüchtung.

(The utilization of species and genus hybrids in wheat breeding.)

Züchter 1934 : 6 : 205-11.

The main facts concerning interspecific and intergeneric hybridization in *Triticum*, *Aegilops*, *Secale* and *Haynaldia* are briefly reviewed with regard to the practical value of the hybrids.

309. RAUM, H. 633.11:575.127.2:575.11

Fortgesetzte Untersuchungen über die Vererbung von Ähreigenschaften bei Kreuzungen zwischen Emmer- und Dinkelreihe des Weizens. (Further investigations on the inheritance of ear characters in crosses between the emmer and *vulgare* series of wheats.)

Z. Zücht. 1934 : A.19 : 467-508.

A further study of the crosses reported in the earlier contribution (see "Plant Breeding Abstracts," Vol. I, Abst. 505) and a number of other crosses.

The fertility of the hybrids varied very considerably with the particular species and race of each group taken as parent and this influence was superimposed upon the influence of the chromosome balance in the later generations. The fertility in F_1 depended entirely on the parental combination. Crosses with *T. Spelta* were all more fertile than those with *T. vulgare* or *T. compactum*. The observed degrees of sterility in F_2 did not agree with those expected on Sax's theory of chromosome numbers and even Kihara's system of fertilities depending upon chromosome numbers is modified by the different degrees of homology in the chromosomes coming together in different parental combinations, though the proportions of F_2 plants shewing different degrees of fertility were in general agreement with those calculated on Kihara's system. Although the fertility of the F_2 's was mainly less than that of the F_1 , it was greater in six families, viz. all those which involved *T. dicoccoides spontaneonigrum* and *T. dicoccoides Aaronsohni*.

The observations on length of rachis segments shew that the formula for *T. dicoccoides* should be *AABBCCLL* and not *AAbbCCLL* as given in the previous paper ; similarly *T. turgidum* is found to have only one length gene and not two as previously assumed and the *T. dicoccum rufum* used in the present crosses contains the *compactum* gene *C* not observed in the previous crosses.

In the F_2 of *T. vulgare* x *T. durum* or *T. turgidum* plants with attached glumes always appeared ; this indicates that an inhibiting factor *H*, preventing the attached glumes, is present in *T. vulgare* in the extra set of chromosomes, *T. vulgare* therefore having the formula *SShh(HH)*. It is assumed that the genes in the extra chromosome set have a greater potency than those in the bivalent chromosome set, the gene for attached glumes being always in the bivalent chromosome set. The following genotypes in the 42 chromosome series would produce attached glumes : *SShh(hh)*, *SSHH(hh)* and *SShh(—)* ; and the following genotypes would be loose : *SSHH(HH)*, *SShh(HH)* and *SSHH(—)*. A considerable deficit of intermediate plants is ascribed to the greater frequency of the inhibiting factor in the viable than in the lethal zygotes. The F_3 behaviour of these crosses and of the speltoids occurring in the *T. vulgare* x *T. turgidum* cross is given. Segregating speltoids have the formula *SSHH(h)* or *SShh(h)* and homozygous speltoids (28 chromosomes) *SShh*. This latter formula also serves for *T. dicoccoides* ; in crosses of this species with a number of varieties of *T. vulgare* various formulae for these latter are adduced to explain the different results in different crosses. The formulae alone do not explain the ratios obtained and it is assumed that the extra chromosome (*H*) in some crosses frequently changes to (*h*), giving a larger proportion of attached glumes. An

excess of intermediates in other crosses is explained by interchange between one paired and one unpaired chromosome, converting $SShh(H)$ into $SShh(h)$. Somewhat similar results were observed in the crosses of *T. dicoccum* and *T. durum* with *T. vulgare* and also in crosses between two species with attached glumes, *T. dicoccoides* x *T. Spelta*, in which the loose-glumed segregates often predominated. This is explained on the assumption that *T. Spelta* has the formula $SSHH(hh)$.

Types with brittle rachis also appeared in crosses between two tough species, such as have only been observed in crosses of species of different chromosome number; their inheritance is explained on similar lines to the glumes, a factor *B* for brittleness and a recessive inhibitor *H* being assumed. No intermediate types appeared but the same disturbing influences were observed in the various combinations, though in this case the inhibiting factor was apparently more frequent in the lethal than the viable zygotes. Tough rachis appeared in some crosses of *T. dicoccoides* x *T. Spelta*. In this case the formula $BBHH(hh)$ is adduced for *T. Spelta*, according to which the inhibiting factor, being in a different chromosome pair, is distinct from the inhibitor for glume attachment.

Awnless plants also appeared in crosses of two awned species. The segregation ratios indicate that the hexaploid series of wheats contains an awn factor and an inhibitor both of which are distinct from those in the tetraploid series, but all present in the bivalent chromosome set. The inhibitor *I* in the tetraploid series works only in presence of the inhibitor *H* of the hexaploid series; the latter is therefore regarded as more ancient. The formulae so derived give satisfactory explanations of the figures, except that in certain cases disturbances due to chromosome interchange have to be assumed. It also appears that the inhibitor of the tetraploid series is present in one of the varieties of *T. vulgare* which in the keel and other characters shewed affinities with *T. turgidum*.

Very few of the crosses of smooth by pubescent glumed species gave 3 : 1 ratios and pubescent glumes appeared in crosses of two smooth species. Again an inhibiting factor is assumed to be present; when it is in the univalent chromosome set the segregation ratios are disturbed.

White ears usually appeared in crosses of two brown-eared species and an excess of them in crosses of brown or black x white. Again the presence of inhibiting factors is assumed.

The author considers that the characters which differentiate the wild from the modern cultivated wheats are not absent in the latter but only suppressed by inhibiting factors which have arisen later in the evolution of the species.

310. KANIEWSKI, C. 633.11:575.127.2:575.11.061.2
 Sur l'origine des nouvelles espèces dans les croisements entre les types tétraploïdes du froment. (On the origin of new species of wheat in crosses between tetraploid wheat types.)
 C. R. Soc. Biol. Paris 1932 : 111 : 100-02.

In a cross of *Triticum polonicum* x a dense-eared form of *T. dicoccum* a dense *T. polonicum* appeared and is regarded as a new species, *T. polonicoides*, constituted by the superimposition of the factor for long glumes, etc., upon the factor complex of *T. dicoccum*; plants of the type *T. durum* also appeared. *T. polonicoides* when crossed with lax *T. durum* gave *T. dicoccum* and *T. polonicum*, shewing that the glume factor segregates independently of the characters distinguishing *T. durum* and *T. dicoccum*.

311. YAMASHITA, K. 633.11:575.127.2:576.312.3
 (Karyological studies on a triploid *Triticum* hybrid and its progeny.)
 Botany and Zoology Tokyo 1934 : 2 : 1325-36.

The triploid F_1 hybrid of the cross *T. persicum* Vav. var. *fuliginosum* Zhuk. x *T. aegilopoides* Bal. var. *boeoticum* Per. was cytologically examined as well as its progeny of the F_2 and F_3 . The number of bivalents in the first metaphase varied between 5 and 7, $6n + 9r$ being the most frequent. The number of closed bivalents was more numerous than the open ones. Trivalents occurred fairly frequently and one tetravalent was observed. One F_2 plant had 29 chromosomes and had probably arisen from a 15 chromosome egg cell fertilized by a 14 chromosome emmer pollen grain. The chromosome numbers of 45 F_3 plants were examined and 28, 29, 30 and 29 and a fragment were observed. The 30 chromosome plant was completely sterile and the 28 chromosome plants also nearly or completely so.

312. MIÈGE, E. and SIMONET, M. 633.11:575.127.2:576.356.5
Étude caryologique de types *durum* apparus dans le croisement *Triticum vulgare* var. *alborubrum* x *T. vulgare* var. *oasicolum*. (**Karyological study of the *durum* types that have appeared in the cross *T. vulgare* var. *alborubrum* x *T. vulgare* var. *oasicolum*.**)
C. R. Acad. Sci. Paris 1933 : 197 : 1751-53.

In previous papers it has been recorded (see "Plant Breeding Abstracts" Vol. III, Abst. 54 and Vol. IV, Abst. 655) that in a cross between two *T. vulgare* H. ($2n = 42$) typical *durum* forms appeared in the F_3 .

The types obtained in the $F_4 - F_8$ are described. Since 1929 the forms appear to have been fixed and no new variations have appeared.

A morphological and karyological study has been made of the lines derived from the "durelloid" forms that appeared in F_3 among the progeny of strain 6 which up to that time had retained *vulgare* characteristics. Eight types were observed :—(1) *T. vulgare* (differing slightly from the normal type) ; (2) *T. vulgare oasicolum* ; (3) *Spelta-oasicolum* ; (4) *T. vulgare oasicolum inflatum* and (5) *Spelta-durum* with some *oasicolum* characters ; the remainder, (6) *T. durum* types, (7) *durelloids* and (8) *T. dicoccum*, on the other hand had the formula $2n = 28$ of the group to which they belonged.

From the foregoing it is deduced that cytologically (a) the *oasicolum* and *inflatum* types in spite of their morphological and biological peculiarities do not differ in any way from *T. vulgare* and from *T. Spelta* ; (b) in spite of their peculiar special genetic origin the *durum* and *dicoccum* types derived from the intraspecific *vulgare* cross have the karyological structure of the types to which they correspond ; and (c) the forms intermediate between the two groups with $n = 14$ and $n = 21$ (*durelloids* and *Spelta-durum oasicolum*) shew no chromosomal aberrations and have the formula either of the *vulgare* with $2n = 42$, or of the *durum* with $2n = 28$.

It may therefore be supposed that the $n = 14$ forms originated through the presence and subsequent elimination of monovalents during reduction divisions.

After 11 generations only fixed types are to be seen, some having remained *vulgare* forms, others having reverted to the ancestral forms of the *durum* type with $n = 14$.

313. WAKAKUWA, S. 633.11:575.127.2:581.481
633.11:575.127.2:581.483
Embryological studies on the different seed-development in reciprocal interspecific crosses of wheat.
Jap. J. Bot. 1934 : 7 : 151-85.

A full report in English of the work already summarized in "Plant Breeding Abstracts" Vol. IV, Abst. 127.

314. PAVLOFF, K. 633.11:575.127.5:633.14
(**A natural hybrid of *T. vulgare* x *S. cereale*.**)
Svedenie po zemledeliu (Agric. Notes) 81-87.

A morphological description is given of two natural wheat-rye hybrids found in 1931. The hybrids were in most characters intermediate between wheat and rye ; the stamens were unduly small, contained very little if any pollen, and failed to dehisce.

315. TAYLOR, J. W. 633.11:575.127.5:633.14:575.11
Irregularities in the inheritance of the hairy-neck character transposed from *Secale* to *Triticum*.
J. Agric. Res. 1934 : 48 : 603-17.

The material was taken from selections of the descendants of natural wheat-rye hybrids found in 1918. The three selections chosen resembled wheat in the main characters of the ear except for the possession of the "hairy neck" character of rye.

Records of the results of selfing one of the selections since 1925, which is taken as typical, shewed that it was not genetically constant but produced pure breeding smooth neck forms and variant segregating hairy neck types and the possible causes of this behaviour are briefly discussed.

Crosses were made between the hybrid selections and wheat. Segregation for the wheat characters was normal but the hairy neck character, which was dominant in F_1 , in the subsequent generations behaved irregularly or as a recessive, and a lethal effect which eliminated the homozygous hairy neck type is postulated. Investigations were therefore made on the sterility, germination, height of plant and tillering of the hybrids. No positive correlation was found between degree of pubescence and reduction of fertility and no evidence of differential zygotic lethals was obtained from germination experiments. The hairy neck plants tillered less than the smooth neck plants but no reduction in height due to the hairy neck character was observed. The results of back-crossing shewed a low percentage of functional gametes carrying the hairy neck character and a study of the differential functioning of the pollen cells indicated that pollen grains with the character in question are less viable or that there is slower pollen tube growth.

The behaviour of the wheat-rye plants can best be explained by assuming the occasional loss from the gametes of the rye chromosome carrying the gene for hairy neck. The consequent instability renders them of little practical value.

316.

633.11:575.127.5:633.14:576.312

633.11 *Aegilops*:575.127.5:633.14:576.312

KAGAWA, F. and CHIZAKI, Y.

633.11 *Aegilops*:575.127.2:576.312

Cytological studies on the genus hybrids among *Triticum*, *Secale* and *Aegilops*, and the species hybrids in *Aegilops*.

Jap. J. Bot. 1934 : 7 : 1-32.

The cytological investigations were made on meiosis in the pollen mother cells of the F_1 plants, which on the whole were intermediate in character and all completely sterile in open pollination. Eight F_1 plants were raised from the cross *T. compactum* ($n = 21$) and *S. cereale* ($n = 7$). Such hybrids had not been examined previously and the reduction division is described in detail. One to three bivalents were observed and the formation of restitution nuclei was frequent. The results with the F_1 hybrids of *T. Spelta* x *S. cereale* resembled those obtained by other workers. In the cross *T. durum* x *S. cereale* 1-5 bivalents were observed and restitution nuclei occasionally occurred.

The F_1 hybrid of *Aegilops triuncialis* x *S. cereale* shewed 1-3 trivalents and where trivalents were lacking 3-7 bivalents. An attempt was made to distinguish the chromosomes by their size, but more precise investigations are needed. Dyad pollen grains were formed in some cases. In the hybrid *Ae. cylindrica* x *S. cereale* 2-7 bivalents were observed and occasionally dyad pollen grains. The parental chromosomes could not be distinguished. The cross *Ae. ovata* x *S. cereale* shewed 2-5 bivalents and frequent trivalents though not more than one in each pollen mother cell.

The cytological behaviour in the following interspecific *Aegilops* hybrids is also briefly described :- *Ae. cylindrica* x *Ae. speltoides*, *Ae. cylindrica* x *Ae. ovata* and *Ae. cylindrica* x *Ae. ventricosa*. The relation between restitution nuclei and the production of amphidiploid forms is discussed.

317.

WAKAR, B. A.

633.11:575.127.5:633.289

Bastarde zwischen Arten der Gattung *Triticum* und Arten der Gattung *Agropyrum*. (Hybrids between species of the genus *Triticum* and species of the genus *Agropyrum*).

Züchter 1934 : 6 : 211-15.

Crosses were made between the following species of *Triticum* : *durum*, *vulgare*, *dicoccum*, *monococcum*, *polonicum* and *Spelta* and of *Agropyrum*, *repens*, *tenerum*, *glaucum* and *elongatum*. Hybrid plants were only obtained from the crosses between *T. vulgare* and *T. durum* with *A. elongatum*. The hybrids, which were completely sterile, resembled the *Agropyrum* parent and their morphological characters are briefly described. They were perennial in habit and shewed heterosis.

318.

KATTERMANN, G.

633.11:575.129:633.14

Entstehung und Züchtung intermediärkonstanter Weizenroggenbastarde. (The origin and breeding of intermediate constant wheat-rye hybrids).

Züchter 1934 : 6 : 145-46.

Since the transference of single rye characters to the wheat genom has not been of practical

value, the combination of the two genomes in an amphidiploid form offers the greatest chance of success in obtaining an economically valuable hybrid.

Two cases have already been recorded, the *Secalotriticum* of Meister cytologically examined by Levitsky and Benetskaja (see "Plant Breeding Abstracts" Vol. II, Abst. 595) and the balanced 28 chromosome form of Lebedeff.

Six possible ways in which such an amphidiploid might originate are briefly described.

319. LEBEDEFF, V. N. 633.11:575.129:633.14:576.356.5
 Neue Fälle der Formierung von Amphidiploiden in Weizen-Roggen-Bastarden
 (Vorläufige Mitteilung). [New cases of the formation of amphidiploids
 in wheat-rye hybrids. (Preliminary contribution.)]
 Z. Zücht. 1934 : A.19 : 509-25.

Amongst a lot of F_2 plants obtained by pollinating wheat x rye hybrids with rye pollen one plant was observed to have much higher fertility and to be much closer to wheat than the rest of the population. Its chromosome number proved to be 56 and it was evidently an amphidiploid.

The wheat parent was a central Asiatic form of *T. vulgare suberythrospermum*, whose reduction division was observed and found to be entirely regular. The F_1 was of the type common for wheat-rye hybrids, with a fertility of 0.12 per cent. For this reason the rye pollen was introduced without previous emasculation. The amphidiploid, though it resembled the F_1 in most respects, differed from it in certain important features; it resembled the amphidiploid at Saratov (see "Plant Breeding Abstracts," Vol. I, Abst. 501) in all essential characters. The percentage of good pollen grains in twenty samples involving 500 pollen grains amounted to 78.4. The proportion of fertile flowers was 38.0%.

Another family of rye-wheat hybrids is described which had a fertility as low as 0.08-0.09 per cent when pollinated with rye pollen. In 1931 however certain F_1 plants were distinguished by unusually high fertility. These plants moreover were all traced to the same plant of the wheat parent. The grains produced by them were exceptionally large, with a 1,000 corn weight of 72 g., i.e. higher than either *T. vulgare* or rye. Thirteen of the plants were examined cytologically and all but one had a somatic number of 56 or thereabouts.

In view of the very low fertility these amphidiploids cannot be supposed to have arisen by self-fertilization and the authors conclude that they owe their origin to apomixis following upon the pollination with rye pollen. In support of this is the fact that some of them do not possess the full 56 chromosomes, some chromosomes having evidently failed to split in the equational division. Chromosome numbers of 53-56 were counted.

Cases are quoted in which perfectly regular meiosis has been observed in plants segregating from wheat x rye crosses and containing all 14 rye chromosomes. The difference in the plasma of the two species is therefore not sufficient to explain the chromosome irregularities in the amphidiploid. No conjugation of wheat and rye chromosomes occurs and this therefore is no reason for the irregularities. It is further pointed out that different strains of amphidiploids differ in fertility and in regularity of meiosis, some being up to 100 per cent normal. It is concluded that the fertility of the amphidiploids is influenced by the races of the parental species used and that chromosome irregularities are not inevitable in amphidiploids. Unpublished material is referred to shewing that races of wheat differ in their capacity for auto-syndesis when used in crosses and the present results shew that the capacity for apomixis is also a racial character.

The chromosome numbers of the hybrids obtained with rye pollen shew that the egg cells with chromosome numbers approaching the unreduced number are the most fertile. By fertilizing these with pollen from the amphidiploid a new amphidiploid of different genetical constitution may be formed. Another suggested way of producing genetic variation in amphidiploids is to cross several of them among themselves.

320. UCHIKAWA, I. 633.11:575.242
(Genetico-cytological studies and wheat speltoids. I. Speltoids of the C series.)

Contr. Lab. Genet. Biol. Inst. Kyoto Imp. Univ. No. 43: 31-44.

The haploid number is 21 for homozygotes and heterozygotes. In the heterozygotes a heteromorphous pair is present. The author supports the assumption made by Nishiyama in fatuoids that the smaller partner designated s_1 of the heteromorphous pair has arisen by the fragmentation of the c -chromosome. In the heterozygote therefore this pair is represented by cs_1 , in the homozygote by s_1s_1 and in the normal plant cc .

The difference in size of the two chromosomes of the heteromorphous pair is much more striking in the speltoid heterozygote than in the fatuoid.

321. HUSKINS, C. L. and SPIER, J. D. 633.11:576.354.46
The segregation of heteromorphous homologous chromosomes in pollen mother-cells of *Triticum vulgare*.
 Cytologia 1934: 5: 269-77.

A heteromorphous bivalent was found in three different strains of wheat. In (a), the spindle-fibre attachment on the larger chromosome was median and on the smaller, terminal; in (b), and (c), both members of the pair had sub-median attachment constrictions. Their behaviour during meiosis also differed, in (a) the first maturation division was reductional and (b) and (c) shewed both reductional and equational first divisions.

Three possible explanations of this behaviour are discussed. The only hypothesis to fit the facts is that sister chromatids are associated at the spindle attachment and that equational first divisions of heteromorphous bivalents are due to crossing-over.

322. YAMASAKI, Y. 633.11:576.356.52
The haploid plant of common wheat, *Triticum vulgare*, Host.
 Cytologia 1934: 5: 305-07.

Three haploid plants, much below normal in size and nearly or completely sterile are described. An investigation of the somatic metaphase in the roots shewed 21 chromosomes.

This is the fourth reported case of haploidy in the genus *Triticum* and the first in the species *T. vulgare*.

323. MCKINNEY, H. H. et al. 633.11:581.143.26.03

Field experiments with vernalized wheat.

Circ. U.S. Dep. Agric. 1934: No. 325: Pp. 8.

Germinated seed of a number of varieties of spring and winter wheats was vernalized and the yields compared with that of the untreated varieties.

The results, though inconclusive, suggest that many of the spring varieties now cultivated in U.S.A. are so well adapted that the vernalization of winter varieties is unnecessary and it is doubtful whether the yields of vernalized spring wheat will offer any material advantage.

Improvement in the technique might make the method of some use in certain districts.

The method can, however, be used with advantage for the more rapid increase of progenies and selections in breeding work.

324. MCKINNEY, H. H. and SANDO, W. J. 633.11:581.143.32:581.44:575
 634.97:581.143.32
Twisted wheat and twisted trees. Twisting of the rachis of wheat heads by short daily photoperiods suggests a new approach to studies of twisted trees.
 J. Hered. 1934: 25: 261-63.

Certain varieties of wheat grown under daily photoperiods of less than thirteen hours or under continuous light of low intensity have shewn a marked twisting of the internodes at the base of the rachis in some the tillers of a single plant.

From the fact that not all varieties shew twisting under these conditions it is assumed that heritable factors are involved. The phenomenon of twisted trees is brief considered in the light of the results on wheat.

325. LUK'JANENKO, P. P. 633.11:581.162.3:578.08
(New method of artificial pollination in wheat).
 Semenovdstvo (Seed Growing) 1934 : 4 : 6-7.

The method consists in emasculating large numbers of ears, cutting off their glumes about the middle and placing them in isolators with ears of the male parent in which anthesis is just beginning. In both intervarietal and interspecific crosses the method gave slightly better results than the ordinary process of pollination. One worker can pollinate eight to ten thousand flowers per day by this method, compared with a maximum of 800 by the old.

If the male parent is not available in large quantities the ears are cut off and placed in jars of water overnight, otherwise the two strains to be crossed may be planted side by side.

326. HEUSER, W. 633.11-1.415.2-1.521.6:575
 633.16-1.415.2-1.521.6:575
 Zur Züchtung von bodensäureunempfindlichen Weizen- und Gerstensorten.
(On the breeding of wheat and barley varieties adapted to acid soils).
 Dtsch. landw. Pr. 1934 : 61 : 141-43.

Comparative tests of varieties and strains of wheat on acid soil, with and without lime, shewed that forms tolerant of acid soils do exist. One, a selection from the old land race Sandomir yielded well, though less than rye. It will, however, be used as a parent in breeding work. Among barleys, the two varieties Hado and Pflug's Extensiv were outstanding. Compared with such a variety as Heines Hanna the root system of Hado was much longer and better developed.

Crosses are being made between Hado and a very early strain of Warthebruch barley in the hope of producing a spring type which ripens at the same time as winter barley and is resistant to acid soil and can also be grown where the soil is sandy.

327. ROŠČIN, I. S. 633.11-1.524.4(47)
(Ancient local spring and winter wheats).
 Semenovdstvo (Seed Growing) 1934 : 4 : 32-36.

Some of the most excellent present-day wheats have been produced by breeding from the country wheats of Russia. Expeditions have been sent therefore to study these wheats. Some proved to be distinctly inferior but certain excellent wheats were found and are being further studied for use in breeding.

328. SCHOLZ, J. 633.11-1.547.1-1.521.6:578.081
 Jak zlepšiti stanovení sklonu pšeničných odrůd k porůstání? **(How to improve the testing of wheat varieties for after harvest sprouting?)**
 Věstn. čsl. Akad. Zeměd 1934 : 10 : 430-35.

A satisfactory method was evolved and used for testing the tendency to germination in the ear. Experiments shewed that the tendency to sprouting in the ear is a varietal character. Most varieties with a long after-ripening period are more resistant to sprouting than varieties with a short ripening period, which are apt to sprout readily. All the *Triticum durum* varieties tested shewed only a very slight tendency to the defect.

The morphological structure of the ear is not the sole cause of the tendency to germination in the ear.

329. VETTEL, F. and PELSSENKE, P. 633.11-1.557:664.641.016:575(43)
 Können wir ertragreiche Qualitätsweizen züchten? **(Can we breed high yielding wheats of good quality?)**
 Züchter 1934 : 6 : 193-99.

To solve the frequently discussed problem of whether it is possible to combine high quality and high yield in wheat, a number of strains of spring wheat, as well as other strains and selections

were tested for quality over a three year period. Resistance to lodging and to rust was also tested and unsatisfactory plants discarded. The tabulated data show that it is possible to combine not only a high quantity of gluten but also good gluten quality with high yield. By the use of Pelshenke's meal fermentation method and the swelling test a large number of tests can be carried out on small quantities of material and at a low cost.

As it has already been shown that good quality is inherited as a recessive character, selection can be begun in the F_2 generations and so the breeding for varieties rich in gluten can be speeded up.

330. WONTERGHEM, J. van 633.11-2.111-1.521.6:575
De wintervastheid der tarwe. Conclusies uit een onderzoek in 1929 en 1934 op het Veredelingsstation van den Boerenbond, te Heverlee. (**Winter-hardiness of wheat. Conclusions from an experiment in 1929 and 1934 at the Breeding Station of the Farmers' Union, Heverlee**).
Onze Ploeg 1934 : No. 4 : 109-13.

Certain new varieties bred at Heverlee from crosses of winterhardy and stiff strawed Swedish wheats with high yielding Dutch, English and French varieties are now in the seventh generation and already breeding fairly true and are most promising in regard to winterhardiness and also yield and grain quality.

331. VATSENKO, A. A. 633.11-2.112-1.521.6(47.7)
(**New varieties of wheat for the western steppes of the Ukraine**).
Semenovodstvo (Seed Growing) 1934 : 4 : 61-64.

Five new selections of *Triticum durum* found successful in the state variety trials are very briefly described, with indications of their origin, yielding capacity and grain quality. They excel the standard and local varieties in yield ; they equal them in quality and are highly resistant to drought. They also display pronounced resistance to Hessian fly.

There follows a similar account of three new winter wheat selections characterized, among other things, by winterhardiness combined with increased earliness as well as drought resistance.

332. TINGEY, D. C. and TOLMAN, B. 633.11-2.451.2-1.521.6:575.11
(**Inheritance of resistance to loose smut in certain wheat crosses**).
J. Agric. Res. 1934 : 48 : 631-55.

Pure line crosses were made between Hope x Federation, Hope x Dicklow No. 3 and Preston x 01-24, a segregate of unknown parentage. Only Hope was immune to the inoculum used, the other varieties shewing varying degrees of susceptibility.

From data previously secured the inoculum appeared to be pathogenically comparatively uniform. The reaction of the parent plants towards loose smut (*Ustilago tritici*) indicated that at least three cumulative factors were involved and that each of the three factors had a different effect in degree. Hope is assumed to possess all three factors and Federation none, the other two varieties each possess two factors, one in common.

An analysis of the reaction of the progeny of the crosses supported this assumption.

No relationship was found to exist between disease resistance and the morphological characters, awns, and colour of glume and grain.

333. SCHLEHUBER, A. M. 633.11-2.451.3-1.521.6:575.11
(**Genetics of resistance to four physiologic forms of bunt in two winter wheat crosses**).
Northw. Sci. 1933 : 7 : 43-48.

Crosses were made between Albit x Minhardi and Albit x Buffum 17 and the reaction of the parent plants and of the F_3 progeny tested for resistance to one form of *Tilletia levis* Kuhn., Pl-5, and the three forms Pt-1, Pt-2 and Pt-13 of *T. tritici* (Bjerk.). Of the parents, Albit was immune to Pt-1 and Pl-5 and Buffum slightly resistant to Pt-1, otherwise all were susceptible. The F_3 progenies of both crosses were completely susceptible to Pt-13 and Pt-2 but all degrees from immunity to complete susceptibility to Pt-1 and Pl-5 were found. The data from the

cross Albit x Minhardi indicate the presence of two main factors for resistance to Pt-1. The same two factors determine resistance to Pl-5 but a factor inhibiting the action of one of the resistance factors which is activated by Pl-5 is carried by Minhardi.

Multiple factors, probably four, were found to determine the resistance to Pt-1 and Pl-5 in the cross Albit x Bufum.

None of the parents possesses genes for resistance to forms Pt-13 and Pt-2.

334. 633.11-2.451.3-1.521.6:575.11

WISMER, C. A.

633.11-2.452 *P. triticea* -1.521.6:575.11

Inheritance of resistance to bunt and leaf rust in the wheat cross, Oro x Tenmarq.

Phytopathology 1934 : 24 : 762-79.

The inheritance of resistance to bunt (*Tilletia levis*) was studied in the F_2 , F_3 and F_4 generations from an Oro x Tenmarq cross and leaf rust (*Puccinia triticea*) resistance in the F_4 generation.

The data indicate that high susceptibility to bunt is recessive in this cross ; and from the fact that F_4 lines were grown that were more resistant than the resistant parent, Oro, it seems that Tenmarq may also carry a factor or factors for resistance differing from the factors present in Oro. Bunt resistance in this cross was probably controlled by multiple factors.

Oro is very susceptible to leaf rust ; Tenmarq is only moderately so. Transgressive segregation for leaf rust reaction indicated that factors for resistance were probably present in both parents.

No correlation was apparent between bunt and leaf rust infection in the hybrids.

A number of rows in 1932 and 1933 shewed a combination of the superior qualities of Oro and Tenmarq, so that further selection should yield a bunt resistant variety of considerable agronomic value.

335. GASSNER, G. and STRAIB, W. 633.11-2.452 *P. glumarum* :576.16

Untersuchungen über das Auftreten biologischer Rassen des Weizengelbrostes im Jahre 1932. (On the occurrence of biological races of yellow rust of wheat in the year 1932.)

Arb. biol. Reich. Land- u. Forstw. 1934 : 21 : 59-72.

A continuation of the work reviewed in " Plant Breeding Abstracts," Vol. III, Abst. 362. The technique and certain modifications that were introduced are discussed. An analysis of 77 *Puccinia glumarum* samples from 59 collections from different localities, mostly in the German wheat growing regions resulted in the identification of 11 different races of yellow rust, of which three, Nos. 15, 16 and 17 were new.

Geographical distribution was irregular and obviously connected with the particular wheat grown in the various districts.

336. 633.11-2.452 *P. glumarum* :576.16:581.036

GASSNER, G. and STRAIB, W.

633.11-2.452-1.521.6

Experimentelle Untersuchungen zur Epidemiologie des Gelbrostes (*P. glumarum* [Sch.] Erikss. et Henn.). [Experiments on the epidemiology of yellow rust (*P. glumarum* [Sch.] Erikss. et Henn.).]

Phytopath. Z. 1934 : 7 : 285-302.

High temperatures were again found (see " Plant Breeding Abstracts," Vol. II, Abst. 56) to increase the resistance of wheat to rust and marked varietal differences exist as regards the critical temperature above which susceptibility becomes resistance or immunity as the case may be. These findings explain the increased " summer resistance " in field experiments with wheat.

Tests of 31 varieties of wheat with 4 yellow rust races shewed that the critical temperature was determined by the wheat variety and by the race of rust used.

In breeding for resistance it is important to ascertain not only whether a given race of rust can infect numerous varieties but also whether at summer temperatures it can produce severe infection and fructification on the host.

Resistance experiments should be made in the greenhouse at both low and high temperatures, the former to determine the absolute resistance or immunity, the latter to determine the relative resistance and to obtain some indications bearing on "summer resistance."

Though absolute resistance is the ideal aim in breeding, varieties with good comparative resistance may be utilisable under climatic conditions which promote the full expression of the resistance capacity present.

337. STROEDE, W. 633.11-2.452 *P. triticina*:576.16:581.9(43)
 Untersuchungen über die geographische Verbreitung der physiologischen
 Formen des Weizenbraunrostes, *Puccinia triticina* Erikss. in Deutschland.
 (Investigations on the geographical distribution of the physiological
 forms of brown rust of wheat, *P. triticina* Erikss., in Germany.)
 Arb. biol. Reich. Land- u. Forstw. 1934: 21: 115-20.

The distribution and frequency of occurrence of *P. triticina* was studied in forty-five collections from various localities in Germany.

The difficulties of obtaining accurate information for a comprehensive survey of biotypes in Germany are pointed out. In general the author inclines to the view that there is no question of sharply defined limitation to particular localities for the physiological forms.

338. STRAIB, W. 633.11-2.452 *P. glumarum*-1.521.6:575.11
 Untersuchungen zur Genetik der Gelbrostresistenz des Weizens. (On the
 genetics of yellow rust resistance of wheat.)
 Phytopath. Z. 1934: 7: 427-77.

Using the same technique as in other experiments (see "Plant Breeding Abstracts," Vol. IV, Abst. 362 and V, Abst. 335) a large number of direct and reciprocal crosses and varieties of wheat, nearly all *T. vulgare*, were tested by seedling inoculation in the greenhouse.

In the F_1 and F_2 from crosses between susceptible and immune varieties, complete immunity to various races of the rust proved fully dominant and appeared to be monofactorial.

In the susceptible x resistant series the results were somewhat obscured by the effects of temperature and possibly also of heterosis and of labile genes. In the F_1 high resistance proved either dominant, intermediate or recessive, according to wheat cross and the race of rust involved. Absolute immunity, however, was invariably dominant. In the F_2 there were indications of the action of several dominant genes conditioning absolute resistance in the Chinese 166 x Peragis cross and evidence of transgressive segregation in the direction of increased susceptibility in the Rümkers Sommerdickkopf x Heines Kolben cross. In another cross the resistance of Heines Kolben to race 16 was monofactorially inherited and independently of resistance to the other rust races tested.

From the F_3 - F_4 generations it was furthermore deduced that in a given wheat cross immunity and resistance to numerous races of the pathogen could be transmitted by the same factor (or factors) and that race groups of yellow rust could be established on this basis—a fact which in practice should very considerably reduce the number of races to be tested. Such rust groups would, however, have to be determined for each cross individually.

No correlations were found between yellow rust resistance and glume colour, awning, anthocyanin formation in the coleoptiles or winter and summer habit.

Questions of technique are discussed with reference to possible explanations of the various discrepancies between the author's results and those of other workers.

339. FLEURENT, E. 633.11:664.641.016
 La génétique des blés et la panification. (Baking and the genetics of
 wheat.)
 C.R. Acad. Sci. Paris 1933: 197: 1695-97.

Deals with physical and chemical problems—not the genetic aspect.

340. PELSHENKE, P. 633.11:664.641.016:575(43)
Qualitätszüchtung bei Weizen. (**Breeding for quality in wheat.**)
Züchter 1934 : 6 : 169-72.

Gluten quality, one of the main components of quality in wheat, is primarily a varietal character and must therefore take first place in breeding, though gluten content cannot be entirely neglected. Berliner and Koopmann's gluten swelling test combined with the meal fermentation method of the Institut für Pflanzenbau, Halle, which are economical and reliable and also enable winter wheat strains to be tested between sowing and harvesting, are recommended for the determination of wheat quality by the breeder. Since both methods require a minimum of 50 g. of wheat grains, selection can be begun in the F_3 . The Hankoczy-Brabender farinograph can be used at a later stage.

Selection for well-formed grains and uniformity is important and vitreousness and gluten content have proved to be positively correlated to a certain degree within a variety though not in different varieties.

Investigations since 1929 at Halle have shewn that in general good quality is recessively inherited. Wheats of the very best quality only should be used as parents in crossing and Garnet, Tenmarq and Bankuty 1201, a Hungarian wheat, have given most promising results.

From the results of a Peragis x Garnet cross it seems that high yield and quality can be combined.

The question of the chemical treatment of meal in relation to wheat breeding and the areas in Germany that are at present producing high, medium and low quality wheats are briefly discussed with reference to Germany's economic independence of imported wheat in the future.

341. BORASIO, L. 633.11:664.641.016:578.081
Il metodo Pelshenke per l'esame rapido della qualità dei frumenti. (**The Pelshenke method for the rapid determination of the quality of wheats.**)
G. Riscicolt. 1934 : 24 : 179-82.

Introducing the Pelshenke test to Italian readers and giving at the same time the results of some tests of a number of new Italian strains of wheat.

342. ENGELKE, H. 633.11:664.641.016:578.081
Die Göttinger Weizenqualitätsprüfungsmethode und ihre Bedeutung für die Weizenqualitätszüchtung. (**The Göttingen method for testing the quality of wheat and its importance in breeding for quality in wheat.**)
Züchter 1934 : 6 : 200-05.

The definition of baking quality and the best means for its determination are discussed. Careful investigations at Göttingen have shewn that the two fundamental hypotheses of the Pelshenke method, namely the equal fermentation capacity of all whole meals and the linear course of the fermentation curve, are not fulfilled. Also the testing of the quality must be extended to the flour as the results on the whole meal do not necessarily imply the same relation in the flour.

These deficiencies, it is claimed, are counteracted by the Göttingen method, of which apparatus and method are here described.

Besides giving data on the quality of the gluten, the diastatic and proteolytic activities can be accurately determined and information obtained on the amount of husk, the tenacity of the dough and the formation of the pores.

343. WILSON, H. K. and MARKLEY, M. C. 633.11:664.641.016:578.081
The wheat meal test for evaluating the qualities of small samples of wheat.
J. Amer. Soc. Agron. 1934 : 26 : 580-86.

Thirty-nine varieties of spring wheat and seventeen varieties of winter wheat were tested by the wheat-meal fermentation time test as outlined by Culter and Worzella and significant differences were obtained.

344. JAKUBZINER, M.
 (Extension of wheat cultivation into the central regions of the European
 part of U.S.S.R.)
 633.11.00.15(47)
 633.11:575(47)

Bull. Appl. Bot. Leningrad 1934 : Ser. A (9) : 163-68.

Report of a conference held in December, 1933. Among other things mention is made of a number of varieties resistant to *Fusarium*. Breeding with spring wheats was begun only in 1932. Various lines, some of local origin and some imported, have already proved superior to the ones now grown. Extension of breeding work is to be carried out in future and the main lines of work are outlined, including extensive investigations of the local population with exchange of material between stations in the zone, application of vernalization, individual plant selection and in special cases intervarietal and even interspecific hybridization.

OATS 633.13

345. BOGDANOV, P. and KORJAGIN, A.
 (A new variety of oats.)
 633.13:575(47)

Semenovodstvo (Seed Growing) 1934 : 4 : 64-66.

The new oat Stepnjak 0648 is distinguished by greater yield than the standard varieties and pronounced rust resistance. It is lower in husk percentage. The main characteristics of the variety are described.

346. 633.13:575.127.2:576.354.4
 633.13:576.356.5

NISHIYAMA, I.
 633:575.127.2:575.11

The genetics and cytology of certain cereals. VI. Chromosome
 behavior and its bearing on inheritance in triploid *Avena* hybrids.

Mem. Coll. Agric. Kyoto Imp. Univ. 1934 : No. 32 : (Gen. Ser. No. 3) : Pp.
 157.

A. strigosa Schreb. ($2n = 14$) was crossed with *A. barbata* Pott. ($2n = 28$) and *A. barbata* with *A. Wiestii* Steud ($2n = 14$) and a cytological study made on the hybrids and their F_2 to F_8 progenies.

The behaviour at meiosis of the triploid hybrids of both crosses was found to be very similar and is briefly described. Seven and occasionally 8 bivalents were observed. Partial homology of the chromosomes is suggested to account for the eighth bivalent. Trivalents occasionally and tetravalents rarely occurred. The variation in chromosome number in the F_2 — F_8 of the triploid hybrids is studied in detail. The plants could be divided into two groups, those with 22 or more chromosomes, the increasing group, as their progeny had generally the same or a higher chromosome number than the parent and the diminishing group with 20 or fewer chromosomes which gradually decrease to 14. The behaviour of the chromosomes in plants belonging to these two groups is considered separately. Meiosis in plants with aberrant chromosome numbers and in some autotetraploid plants is also described.

From the similarity in the cytological behaviour of the two triploid hybrids and the fact that in the diploid hybrid from the cross *A. strigosa* x *A. Wiestii* there are usually 7 closely paired bivalents and fertility is almost complete, it can be inferred that both members of the cross have the same genom constitutions; the consideration of the chromosome affinity in the hybrid *A. barbata* x *A. strigosa* may be taken as applying equally to the hybrid *A. barbata* x *A. Wiestii*. The results of a study of chromosome conjugation in the F_1 hybrid suggest that one genom of *A. barbata* is homologous with that of *A. Wiestii* or *A. strigosa* and the other is partially homologous with it.

The occurrence of quadrivalents or polyvalent complexes in the hybrid progeny is discussed. The percentage of good pollen in the parental species was 97 per cent or more. In the F_1 hybrid 27-37 per cent of the pollen grains were full of cytoplasm. Great variation in the number of good pollen grains was observed among their progeny. Segregates with 7 or 14 bivalents had usually as high a percentage of good pollen as the parents. Differences in the degree of pollen sterility observed in plants with the same chromosome number is accounted for by assuming differences in chromosome constitution.

An investigation of the embryo sacs shewed that, on the assumption that those which are morphologically normal and the fertilized ones are viable, the embryo sac abortion in the F_1 would be 38.16 per cent. Very few (1.32 per cent) of the fertilized embryo sacs shewed a normal development of embryo and endosperm. The behaviour in 15 chromosome plants was also examined. It was found that as the differences in the chromosome number of the parents diminished the abnormalities in the development of embryo and endosperm were correspondingly reduced. With regard to grain setting this is increased with increased chromosome number, complete fertility being regained when the plants have 28 chromosomes. Of the few grains produced by the F_1 hybrids some were plump but others were shrivelled. The former shewed 58.21–72.06 per cent of germination, the latter were non-viable. No close correlation was found between grain germination and chromosome number of the mother plants. It was observed that the tetraploid and still more the hexaploid plants shewed a greater resistance to cold in the seedling stage than did the diploid plants. The frequency of hybrid segregates with different chromosome numbers was investigated and the variation in chromosome number was found to follow both the *Triticum* and *Raphanus-Brassica* schemes.

The inheritance of eight characters was studied in the triploid hybrid *A. strigosa* x *A. barbata*. Most of the characters of *A. barbata* were dominant and the F_1 hybrid therefore resembled the latter species except in time of flowering and sterility. Forty-four F_2 plants and their progenies belonging to the group with increasing chromosome number had the same type of panicle as *A. barbata*. All the F_2 plants with 14 or 15 chromosomes, on the other hand, had panicles of the *strigosa* type. Of three plants with 20 chromosomes two were intermediate, the other resembled *A. barbata*. It is assumed that the *barbata* type of panicle is controlled by factors in a chromosome, or chromosomes, which do not usually pair in the F_1 .

In the triploid hybrids the articulated condition of the base of the grain was dominant and also in most of the F_2 and later generations of the 24–28 chromosome plants. A variety of types ranging from the solid to the articulated type was found among the group with diminishing chromosome numbers and derivatives breeding true for intermediate types were obtained. The progeny of one 14 chromosome plant with the articulated base of the grain segregated into four different types and their behaviour is discussed. A lethal factor is assumed to account for the non-appearance of the homozygous articulated plants. "Steriloid" types were found among the progeny of three plants with 27 chromosomes. These steriloids were always heterozygous, their behaviour is described, and chromosome aberration is suggested in explanation of their origin. The genetics of the pubescence on the back of the grain is studied in some detail. The segregates with 24–28 chromosomes generally resembled *A. barbata* with regard to this character but in the group with diminishing chromosome numbers great variation occurred. The behaviour of the segregates with regard to pubescence on the base of the grain and on the rachilla, colour of the grain, habit of the plants during early growth and flowering time was also investigated. The occurrence of some aberrant types, non-heading, dwarf plants and albinos was observed. Balanced lethal factors are assumed to account for the genetical behaviour of the albinos.

The inheritance in some simple trisomics is described. In the discussion on the results of the genetical and cytological data it is suggested that of the two genoms of *A. barbata*, A and B', the characters contained in the A genom can be transmitted to *A. strigosa* and that the partial homology between the B' genom and the *A. strigosa* genom allows the partial or complete transmission of some characters. The phylogenetical relationship between the two species is briefly discussed and it is suggested that *A. barbata* may have originated from a cross between *A. strigosa* with an allied species, followed by a doubling of the chromosome number.

347. NIEVES, R. 633.13:575.127.2:632.451.2
 Nota preliminar sobre un probable híbrido natural (*Avena byzantina* x *A. fatua*) atacada por *Ustilago levis*. [Preliminary note on a probable natural hybrid (*Avena byzantina* x *A. fatua*) attacked by *U. levis*.]
 Bol. Minist. Agric. B. Aires 1934: 36: 73–79.

An oat field strongly infected with smut, which is extremely rare in Argentina, was found in 1933. The characters of the spores being intermediate between those of *Ustilago levis* and

U. avenae, it is suggested that the fungus is a natural hybrid between the two smut species. The field proved to contain types with characters both of *A. byzantina* and *A. fatua* subsp. *fatua* and is, it is suggested, a segregating population from a cross of these two species in an earlier year. *A. byzantina* is immune and the smut attack is ascribed to the influence of the susceptible parent *A. fatua*. Various other hybrids of these species have been found.

348. RĂDULESCU, E. 633.13-2.451.2-1.521.6
Rezultatul infecțiunilor artificiale la ovăz cu tăciunele sburător (*Ustilago avenae*). [Result of artificial infection of oats with loose smut (*U. avenae*).]
Agricultura Nouă 1934 : No. 7 : Pp. 9.

The resistance of a number of varieties was tested by Reed's method. The resistant varieties belonged only to *Avena sativa* and *A. byzantina*. The Rumanian and German varieties shewed the greatest susceptibility with few exceptions. A comparison with the results of Nicolaisen in Halle on the same varieties indicated that another very aggressive race was present.

349. 633.13-2.451.2-1.521.6:575.11
633.13-2.451.2:575.116.1
GARBER, R. J. and HOOVER, M. M. 633.13:575.11.061.6
Dehulled seed, glume color, and reaction to smut in a certain oat cross.
J. Amer. Soc. Agron. 1934 : 26 : 673-80.

Further experiments were made to test the possibility of linkage between the factor for transgressive susceptibility to smut and black glume colour in the cross Black Mesdag x Gopher. Back-crosses were made between the F_1 and Gopher and a very susceptible F_2 derivative of the original cross. Similar reactions to loose and covered smut were observed in the parents and hybrids.

Dehulling the seed before treatment with smut was found to increase the percentage of smutted plants but the treatment also considerably reduced the vitality of the seedlings. The data on the segregation for glume colour confirmed the original assumption of a single factor difference in the parental varieties and further evidence of transgressive segregation for susceptibility to smut was obtained.

There was no indication of close linkage between glume colour and smut reaction.

- 350 STANTON, T. R., REED, G. M. and 633.13-2.451.2-1.521.6:575.11
COFFMAN, F. A. 633.13-2.451.2 *U. avenae*:576.16
Inheritance of resistance to loose smut and covered smut in some oat hybrids.
J. Agric. Res. 1934 : 48 : 1073-83.

The smut reactions of hybrids from the crosses Monarch Selection x Black Mesdag, Richland x Fulghum, Richland x Markton, Markton x Iogold, Markton x Black Mesdag and Cornelian x Markton are discussed. No reciprocal crosses were made. Three physiological forms of smut were inoculated, *U. avenae*-Missouri, *U. avenae*-Fulghum and *U. levis*-Missouri.

In general the data on the inoculated F_2 plants conformed to expectation.

The data for hybrids 37 and 38 (Monarch Selection x Black Mesdag) inoculated with *U. avenae*-Missouri indicate that resistance is inherited on a 3 : 1 ratio. The occurrence of considerable infection in some F_3 progenies of hybrids derived from entirely resistant parents was noted.

In most hybrids completely resistant progenies predominated over segregating ones, owing to the loss of susceptible individuals—a factor which renders the analysis of smut inheritance difficult.

RYE 633.14

351. ŁADA, P. 633.14:575.11.061.5:581.44
Zur Genetik des "brüchigen" Roggens. (The genetics of brittle rye.)
Bull. Acad. Polon. Sci. Lettres 1933 : 183-93.

A very brittle form of rye occurs occasionally among normal strains. The stems differ in certain morphological details from the normal, such as a reduction in the amount of sclerenchyma of the vascular bundles, a collenchyma like thickening of the walls of the sclerenchyma, etc. Experiments shewed that the character behaves as a simple Mendelian recessive, and, though the allogamous nature of rye complicates the results, extensive tests involving the isolation of the homozygous and heterozygous types confirm this assumption.

352. GASSNER, G. and KIRCHHOFF, H. 633.14-2.452 *P. dispersa* :576.16
Einige Versuche zum Nachweis biologischer Rassen innerhalb des Roggen-
braunrostes, *Puccinia dispersa* Erikss. und Henn. (Some attempts to
demonstrate biological races in brown rust of rye *P. dispersa* Erikss.
and Henn.)
Phytopath. Z. 1934 : 7 : 479-86.

The combined evidence derived from tests on Petkus winter rye of 10 monosporial lines, from four samples of different origin, of brown rust of rye followed by a series of infections on numerous wheats is regarded as proving that *P. dispersa* Erikss. and Henn. comprises physiological races.

Various difficulties of technique are discussed.

MAIZE 633.15

353. YASUI, K. 633.15:575.11.061.634
Genetical studies in *Zea Mays* L. 633.15:575.11.061.6:581.483
Bot. Mag. Tokyo 1933 : 47 : 755-66.

From an analysis of the F_1 , F_2 and F_3 generations from a cross between Pedigree No. 773 (segregating 3 green : 1 yellow) and Pedigree 755 (the F_2 of Pedigree No. 710) it is deduced that albino first occurred from a single mutation in Pedigree No. 710. In the albino $2n$ was found to be 20.

From the ratio obtained between tall albino and dwarf albino namely 63 : 1 it is concluded that more than 3 recessive genes condition the dwarf character.

No direct relation was detected between the gene for albino and pigment formation.

Two or more of the genes for virescent albino have also appeared in the plant material used for these investigations.

In the progenies obtained by selfing Odaishi-kibi the inheritance of purple mottled aleurone layer was studied and grains with this character are regarded as heterozygous, and have the formula either RrS_2s_2 (segregating into 9 purple : 4 yellow : 3 mottled) or RrS_2S_2 (segregating into 2 purple : 1 yellow : 1 mottled).

From the purple, the mottled and the yellow grains albinos appeared in the ratio 1 : 3 ; this appears to be a different albino gene independent of the one previously mentioned and situated in a different chromosome.

354. YASUI, K. 633.15:575.113.4
(Genetical studies in *Zea Mays* L.) 633.15:575.11.061.6:581.483
Bot. Mag. Tokyo 1934 : 48 : 179-85.

The study concerns the colours of the internal tissue of the endosperm as distinct from the aleurone layer.

On crossing a plant of Pedigree No. 582 of Wase-kibi (early maize), breeding true for yellow endosperm, with a plant of Pedigree No. 582 of Shire-kibi (white maize), breeding true for white grains, somewhat yellowish white grains were obtained and the F_3 revealed that there were more than two kinds of yellow and two kinds of white.

As regards white, one type was dominant to yellow and one recessive to it. Subsequent segregations into homozygous and heterozygous yellows and homozygous whites shewed that the white endosperm is conditioned by a dominant gene which inhibits yellow endosperm.

From another cross between a yellow endosperm and a white endosperm strain certain segregations seemed to shew that there were two dominant white genes operative, situated in separate chromosomes; and it is suggested that the gene referred to in the first cross is one of the two.

In a further segregating yellow strain deep yellow, sulphur yellow and pale yellow grains were obtained and it was evident that the sulphur yellow type resulted from the presence of two complementary genes.

The following formula is suggested to represent the various yellows:—

Y_2 deep yellow (probably connected with carotin formation); Y_3 pale yellow and Y_4 sulphur yellow (probably connected with xanthophyll formation) with y_2 and y_3 as the corresponding recessives. Plants homozygously recessive for all three factors have white endosperm; Y_4 is incapable of pigment formation when alone but can lighten the colour when present with Y_2 or Y_3 .

355. JENKINS, M. T. 633.15:575.116.1

Linkage relations of the A_2a_2 factor pair in maize.

J. Amer. Soc. Agron. 1934 : 26 : 719-20.

The A_2a_2 (see "Plant Breeding Abstracts," Vol. II, Abst. 617) factor pair is shewn to be situated in the $Pr-V_2$ linkage group with a cross-over percentage of 7.2* between bt and a_2 . The order of the genes investigated is $pr-bt-a_2$.

Evidence of selective action in favour of A_2 pollen as compared with that carrying a_2 was found.

356. BRINK, R. A. 633.15:575.116.1.061.6:631.557

The anthocyanin plant colors and yield in corn.

J. Amer. Soc. Agron. 1934 : 26 : 697-703.

Experiments on the effect of four different anthocyanin plant colours on yield in corn indicated that if the usual colour, dilute sun-red is taken as a standard, then plants classed as dilute purple and sun-red shewed an increase in yield which may be regarded as being statistically significant, while the purple plants were definitely inferior in yield to the standard.

357. EYSTER, W. H. 633.15:575.116.4-181

Heritable characters in maize. XLVIII. Dwarf₆.

J. Hered. 1934 : 25 : 191-93.

The mutation dwarf₆ (d_6) which behaves as a simple Mendelian recessive to normal is described.

Linkage relationships shew that d_6 lies in chromosome 5 at about 19 cross-over units from the locus of pr and in the order $pr-d_6-bm-ys$.

355. ST. JOHN, R. R. 633.15:575.12:578.08

A comparison of reciprocal top crosses in corn.

J. Amer. Soc. Agron. 1934 : 26 : 721-24.

Crosses between commercial varieties and selfed lines of maize are termed top crosses.

Experiments with inbred lines, selfed for six or more generations, and crossed reciprocally with the Krug variety in 1931 shewed that (1) the yield of a cross of a commercial variety on an inbred is not an accurate criterion of the productivity of its reciprocal; (2) comparisons of the yields from top crosses with those from varieties, double crosses, etc. may not adequately measure the productivity of the inbreds if the top crosses have been made on the inbreds as seed parents.

359. LONGLEY, A. E. 633.15:575.127.5:576.312.32

Chromosomes in hybrids between *Euchlaena perennis* and *Zea Mays*.

J. Agric. Res. 1934 : 48 : 789-806.

The hybrids studied were from the F_1 , F_2 , back-crosses and other more complicated crosses between maize and teosinte.

*Given as 7.1 in summary

With one exception all the F_1 plants shewed 30 chromosomes at the first division anaphase, and 10 bivalents and 10 univalents and as genetic data have shewn that in such hybrids autosynthesis is the rule, the univalents are assumed to be from maize. The bivalents behaved normally and the univalents were distributed at random.

The one aberrant F_1 plant which differed considerably from the others and was only slightly sterile was found to have 40 chromosomes and gave a uniform F_2 , all with the same number of chromosomes.

A plant with 42 chromosomes was found among a twice back-crossed progeny and two others with high chromosome numbers, one with 56, occurred among the F_2 progenies. Observations on the morphology of the chromosomes shewed that definite identification was not possible. Detailed investigations were made on the chromosome number prevalent in the functionary pollen and ovules of the different hybrids. In the pollen this was found to approximate to either 8, 10 or 20, the haploid numbers of the parents but in the ovules the tendency was very much less marked. The significance of this is discussed especially in relation to the problem of the production of new and stable forms.

360. BURNHAM, C. R. 633.15:576.356.2
Cytogenetic studies of an interchange between chromosomes 8 and 9 in maize.

Genetics 1934 : 19 : 430-47.

Work by McClintock (see "Plant Breeding Abstracts," Vol. I, Abst. 531) had shewn that the line of maize known as semi-sterile 2 had at diakinesis and the first metaphase, a ring consisting of the two pairs of chromosomes 9 and 8 and that an interchange had occurred between them of unequal terminal segments of the long arms.

Additional cytogenetical data on the interchange are here presented. The complex of chromosomes involved is referred to as T8-9.

Semi-sterile plants were crossed with normals in both direct and reciprocal crosses. A small deficiency in the percentage of semi-sterile plants was noted in the expected 1 : 1 ratio when semi-sterile plants were used as the pollen parents. Lines homozygous for the interchange were isolated and crossed with normal plants; the semi-sterile F_1 plants were used for tests for linkage of genes and the points of breakage, of which tabulated data, including data provided by Creighton, are given. The order of genes is *C-sh-wx-T8-9* with au_1 and v_1 also probably between *wx* and T8-9.

T8-9 causes no great decrease in crossing-over in the *wx-v_1* interval which includes a region close to the break.

Crosses between Florida teosinte and maize shewed that crossing-over occurred between the maize chromosome 9 and its teosinte homologue but to a varying extent.

Linkage tests involving the unplaced gene *japonica* (*j*) shewed that *j* is in chromosome 8 in that part translocated to chromosome 9. Chocolate (*Ch*) was found to be neither in chromosome 8 nor 7. Linkage tests were made for a number of other genes all of which gave negative results. Cytological studies included counts of the relative frequencies of rings and chains at diakinesis. The interchange complex shews a cross-shaped figure when heterozygous and the study of many figures shewed that the centre of the cross is very constant in its position.

The amount of pollen sterility was studied and the reason for the excess represented by 59 per cent as compared with 50 per cent is discussed.

Data are given of crosses of normal ♀ with trisomics carrying either both interchanged chromosomes from T8-9 or only one.

361. SMITH, S. N. 633.15:581.13:575.11
Response of inbred lines and crosses in maize to variations of nitrogen and phosphorus supplied as nutrients.

J. Amer. Soc. Agron. 1934 : 26 : 785-804.

Observations on 24 inbred lines and 23 single crosses of maize shewed a differential response to phosphorus and nitrogen deficiency.

From an analysis of the behaviour of four inbred lines with their six crosses it is concluded that the ability to maintain relatively good growth on a low level of phosphorus is inherited as a

dominant character. The four inbred lines differed little in the use of nitrogen at low levels so no conclusions could be drawn from their hybrids. Certain marked differences in the root type were found in the four lines studied and their genetic basis and relation to rate of nutrient absorption and phosphate efficiency in hybrids are discussed. The use of phosphorus efficient lines is recommended for the production of hybrids to be used on soils with a low phosphorus supply.

362. SPRAGUE, G. F. 633.15:581.143.26.03
Experiments on iarovizing corn.
 J. Agric. Res. 1934 : 48 : 1113-20.

In the experiment here reported, vernalization consistently reduced the percentage of germination, the number of visible nodes, ears, the plant height and the weight of shelled grain per plant. Pollen shedding and silking were significantly accelerated in some strains, but not enough to be of economic importance. There was no evidence of a darkness requirement for maize. In the author's opinion though vernalization in the United States does not appear to offer any great commercial possibilities, it might have considerable value in physiological and genetic research.

363. 633.15-1.557:575.12
 HABER, E. S. 635.67-1.557:575.12
Yield comparisons of hybrid and open-pollinated varieties of sweet corn.
 J. Amer. Soc. Agron. 1934 : 26 : 704-13.

Comparisons made of the yield of inbred hybrids of the varieties Evergreen, Country Gentleman and of certain other hybrids shewed that sweet corn hybrids may give an increase in yield over the open-pollinated varieties of 10-100 per cent. Other advantages of such hybrids for the commercial grower are discussed.

364. ISIDORO, F. R. 633.15-1.557:581.162
A study of the immediate effects of detasselling upon the yield of Calauan Yellow Flint corn planted ear-to-the-row, and by the ordinary method.
 Philipp. Agric. 1934 : 23 : 226-37.

In the ear-to-row method of planting maize the yield from the detasselled plants exceeded that from the ones that were not detasselled. This comparative yield relationship also held for the ordinary method of planting. The ear-to-row method of planting gave a very much higher yield than the ordinary method. Possible causes of these results are tentatively touched upon but no definite conclusions could be drawn from the available data.

BARLEY 633.16

365. 633.16:575.11:581.46.061.5
 633.16 Wisconsin Barbless, Pedigree 38.

A new strain of barley.
 Science 1933 : 77 : (Suppl.) 8-9.

A note on the origin and qualities of the smooth-awned, white grained barley, Wisconsin Barbless, Pedigree 38. Its yield is higher than Oderbrucker, it is resistant to drought and stripe disease and its malting qualities appear to be satisfactory (see "Plant Breeding Abstracts" Vol. IV, Abst. 704).

366. WIEBE, G. A. 633.16:575.113.4:575.113.7
Complementary factors in barley giving a lethal progeny.
 J. Hered. 1934 : 25 : 272-74.

A cross between a strain of Manchuria and one of Deficiens gave an F_1 that germinated but failed to develop beyond the emergence of the plumule. The reciprocal cross gave the same

result. Crosses between the parents and other varieties and back-crosses between their F_1 progeny and Manchuria or Deficiens gave the expected 1 : 1 ratio of lethal and viable seedlings. The conclusion is therefore reached that the lethal condition in the original cross is the result of complementary factors.

367. JOHANSEN, D. A. 633.16:576.356.52

Haploids in *Hordeum vulgare*.

Proc. Nat. Acad. Sci. Wash. 1934 : 20 : 98-100.

A particular lot of seed from an ordinary commercial seed crop of barley when sown gave rise to plants of which about 10 per cent were puny individuals which, when examined cytologically, proved to be haploids. The chromosome garniture of the normal plants from the same lot is described and illustrated and compared with that of the haploid. The chromosomes of this are somewhat more differentiated one from the other, one of the seven having a detached terminal segment in addition to the primary constriction, and another a fairly large trabant, whereas only one of the seven pairs in the diploid is distinguishable by a not very pronounced secondary constriction.

The mode of origin of such a large proportion of haploids is unknown.

368. MIÈGE, E. and GRILLOT, G. 633.16:581.162.3:575.127

La staurogamie des orges cultivées. Origine de quelques espèces. (**Staurogamia in cultivated barley. The origin of certain species.**)

Bull. Soc. Sci. Nat. Maroc 1933 : 13 : 143-55.

A barley plant found in a field of Italian winter barley, Onzo P.H., grown at Rabat in 1931 had four ears each differing from the other and which are described in detail. Seeds from these four ears were sown and a detailed description is given of the F_2 , which briefly summarized gave 10 four-rowed normal plants, 8 two-rowed normal and 21 two-rowed abnormal plants and 3 plants without ears. The data suggest that natural crossing has occurred between P.H. and a Moravian barley grown near it in 1930. An F_3 was grown which produced a number of different types. The occurrence of a number of other natural hybrids in 1933 is mentioned. Other cases of natural crossing reported in the literature are reviewed and the possible origin of certain intermediate forms by hybridization is discussed.

369. 633.16-2.42-1.521.6:575

HONECKER, L. 633.16-2.42:576.16

Über die Modifizierbarkeit des Befalles und das Auftreten verschiedener physiologischer Formen beim Mehltau der Gerste, *Erysiphe graminis hordei* Marchal. (**On the modification of the infection and the occurrence of various physiological forms of barley mildew, *E. graminis hordei* Marchal.**)

Z. Zücht. 1934 : A 19 : 577-602.

In 1931 a strain of the fungus to which a number of new hybrids had hitherto proved resistant produced considerable infections on these as well as on susceptible lines and further experiments shewed that a new biotype, referred to as strain B, had appeared.

The temperature and lighting had a marked influence on the type of infection produced by the fungus ; thus when tested at a temperature of 15-25°C. the F_3 of a cross Pflugs Intensiv x Katterbacher gave 25 per cent very susceptible, 50 per cent medium and 25 per cent highly resistant, whereas at a temperature of 25-35°C. 25 per cent were susceptible and all the remaining 75 per cent were medium resistant.

The composition of fungus populations of various origins was tested and the method of determining the biotypes is outlined. The new race was met very rarely and its origin in the present case is traceable rather to the abnormal conditions of multiplication of the material than to any mass occurrence in nature. It seems to be incapable of overwintering in the conidial stage.

Mildew infection at present is usually carried over from the winter barleys and the first essential in combating it is that resistant forms of winter as well as spring barleys should be grown. One of the races isolated as being resistant to both A and B biotypes is a winter form and the problem therefore would appear capable of solution by breeding.

370. RONSDFORF, L. 633.16-2.452 *P. simplex* :576.16
 Einige Versuche über biologische Rassen des Gerstenzwergrastes. (Some experiments on biological races of dwarf leaf rust of barley.)
 Arb. biol. Reich. Land- u. Forstw. 1934 : 21 : 109-14.

Investigations of six different samples of dwarf leaf rust *Puccinia simplex* Erikss. et Henn. = *P. anomala* Rostr. from different localities revealed the presence of a new race designated X and characterized primarily by the fact that, in contrast to most other races, it is capable of infecting the Australian Recka barley fairly heavily. Egyptian 4-rowed barley is recommended for inclusion in the standard test collection, as necessary for distinguishing between races II and V and the new race IX.

The results were in general though not entire agreement with Hey's (see "Plant Breeding Abstracts," Vol. II, Abst. 249).

371. KASARYAN, S. 633.16:664.641.016
 (Barley from the point of view of milling and baking.)
 Suppl. 65 Bull. Appl. Bot. Leningrad 1934 : Pp. 63.

In certain parts of the Soviet Union and other countries barley is still used to a certain extent for bread-making by the peasants, on account of its capacity to grow in northern and elevated districts not suitable for wheat or rye.

A review is given of the extremely scanty existing literature on the use of barley for baking, followed by descriptions of the characteristics of the main varieties in cultivation and their mode of origin, first for barley and then for wheat. Tables are given shewing the chemical composition of the most popular varieties of both cereals and of the starch content, 1,000 grain weight, hectolitre weight and flour yield, all of which characters displayed clear varietal differences. Differences were also apparent in direct baking tests, both when the barley varieties were used alone and as mixtures with a standard wheat flour. The relative position of the varieties varied with the proportions of the mixture. The wheat varieties also reacted differently to admixture with barley. Some of the mixtures were equal or even superior to pure flour. The results therefore lead the author to conclude that the study of a greater number of varieties will lead to the discovery of the ideal combination of varieties giving the best possible results on mixing and so permit the use of the maximum quantity of barley in the mixture.

MILLETS AND SORGHUMS 633.17

372. STEPHENS, J. C. and QUINBY, J. R. 633.17:581.162.3
 Anthesis, pollination, and fertilization in *Sorghum*.
 J. Agric. Res. 1934 : 49 : 123-36.

The course of anthesis, pollination and fertilization is described in detail for four varieties of sorghum under Texas conditions. The results are compared throughout with those obtained by workers in India. Experiments on the effect of light, temperature and humidity shewed that the first two exerted the greatest influence on anthesis. Data were obtained on the viability of the pollen, the receptivity of the stigmas and the time that fertilization takes place after pollination.

373. LI, H. W. 633.171:581.162.3
 (Studies in millet breeding methods.) 633.171:575.11:581.483
 Bull. Coll. Agric. Honan Univ. No. 2 : Pp. 22.

Anthesis is described and two main periods during which the flowers open were observed ; 5.60 per cent of natural crossing occurred at a distance of one foot. Waxy endosperm shewed a simple Mendelian inheritance.

374. MARTIN, J. H. 633.174:578.082.1:575
The use of the greenhouse in sorghum breeding.
 J. Hered. 1934 : 25 : 251-54.

In a greenhouse sorghums can be made to bloom throughout the year and crosses made at will ; the plants need not be planted each season, for by vegetative propagation from either branches or tillers plant material at all stages of growth may be made available throughout the year. A generation can be raised during the winter and an F_1 (and in one instance cited, even an F_2) may be obtained for field experiments in the next season. Though five varieties are stated to have been kept growing continuously for six and a half years and a number of others for two or more years, the best conditions for greenhouse cultivation of sorghums have not yet been fully determined but some observations on tillering and on temperature and moisture conditions are contributed.

RICE 633.18

375. CHIAPPELLI, R. 633.18 Roma
 Varietà di riso "Roma." (**The variety of rice "Roma."**)
 G. Riscicolt. 1934 : 24 : 125-27.

The variety Roma No. 214, a selection from Lady Wright, is described. This is a further selection of the named strain No. 12 already distributed.

376. MEULEN, J. G. J. van der 633.18:575(45)
 De veredeling van de rijst aan het proefstation te Vercelli. (**Rice improvement at the Vercelli Experiment Station.**)
 Landbouw 1934 : 9 : 591-602.

A description of a visit to the Vercelli experiment station in 1933 (see "Plant Breeding Abstracts," Vol. IV, Abst. 166). Breeding is directed towards obtaining strains characterized by high quality and yield and resistant to disease and bad conditions of growth, heavy tillering of the plants and non-shattering of the grains.

Improvement is attempted along four lines : (1) importation and acclimatization of varieties ; (2) mass and line selection ; (3) hybrid selection ; and (4) genetic changes induced by irradiation with electric light, etc. So far the first of these methods has been the most successful, while the last named has not yet produced any variations of practical value.

The technique used for mass, pure line and hybrid selection and for artificial crossing is described.

Native x wild rice crosses have so far failed to produce the required type with the vigour of the wild rice and the quality and other good characteristics of the Italian forms.

377. 633.18:575(91)
 BALLY, W. 633.18:575(88)
Genetic improvement and manuring of rice in Malaya and British Guiana.
 Int. Rev. Agric. Rome 1934 : 25 : T 344-57.

A composite survey of the information already reviewed (see "Plant Breeding Abstracts," Vol. III, Abst. 307 and Vol. IV, Absts 546, 547). A bibliography is appended.

378. 633.18:575.11
 TING, YING 633.18:576.16
Wild rice of Kwangtung and new variety bred from the hybrids of wild rice with cultivated rice.

Agron. Bull. Coll. Agric. Sun Yatsen Univ., Publ. Ser. III, 1933 : No. 3 : Pp. 24.

The geographical distribution of wild rice and the history of rice cultivation in China is dealt with briefly. There follows a botanical description of the wild rice. Although morphologically dissimilar, the results of hybridization suggest a close affinity between the wild and cultivated rices and the wild rice is considered to be the origin of the rice now grown in China.

The wild rice crosses naturally and the segregation was studied in the F_2 hybrids.

Type of tillers, erect, spreading or prostrate segregated in a 1 : 2 : 1 ratio. Two ratios 3 : 1 and 9 : 7 were found for colour of the leaf sheath. The factors for awns and for red kernels behaved as simple dominants. The segregation of the ash-black colour of the glumes approximated to a 27 : 37 ratio.

A new variety Yatsen No. 1 which occurred as a recessive with erect unpigmented shoots and awnless unpigmented grain among the progeny of a natural cross of wild rice is described. It has vigorous growth and is resistant to cold and high soil acidity.

379. MIYAZAWA, B.

633.18:575.242

(Several examples of mutation in rice plant.)

Proc. Crop Sci. Soc. Japan 1934 : 6 : 156-58.

Among the numerous cases of mutation in rice three are here described, namely (1) yellow, (2) dwarf semi-fertile and dwarf fertile and (3) dwarf short stem. The one called "yellow" was first recorded in 1920 and has occurred twice since. The mutation, which has a monofactorial basis and breeds true, results in a yellow plant very dwarfed and earing early.

In 1919 four types, normal fertile, normal semi-fertile, dwarf fertile and dwarf semi-fertile were found in the progeny of normal semi-fertile "early Shinriki." The normal fertile forms bred true and the other types segregated.

Among the early plants a short stem mutant arose and in subsequent generations the short stem variants always segregated into short stem and normal plants and the latter bred true. It is suggested that the short stem individuals are heterozygous (*Aa*) and the normals (*AA*).

380.

ICHIJIMA, K.

633.18:575.243

633.18:576.356.5

On the artificially induced mutations and polyploid plants of rice occurring in subsequent generations.

Proc. Imp. Acad. Tokyo 1934 : 10 : 388-91.

Mutations covering all the mutant types hitherto known in rice have been induced by treatment by X-rays, ultra-violet rays and temperature changes. Some appeared in the F_1 , others in the later generations. The material used all consisted of pure lines in which no such mutation had been observed at least during a number of generations. Among the mutants appearing in F_1 were dwarf plants, various recessive ear and leaf characters, recessive awned plants, various grades of sterility and plants ripening 11 days earlier than the parent strain; the latter mutant did not segregate in F_2 .

A second lot of material was treated with smaller doses than the first and shewed no change in F_1 beyond a slight degree of sterility in certain plants. An F_2 consisting of eighty thousand plants was grown, of which 31,000 displayed sterility and 19 had definite morphological peculiarities. Of these, two plants were heteroploid with $2n + 1$ ($= 25$) chromosomes, six were triploid ($3n = 36$) and one tetraploid (48). One further triploid occurred as a result of somatic segregation. In the succeeding year triploids, a tetraploid and a haploid appeared.

All these polyploid plants displayed reduced fertility, especially the triploids. At microsporogenesis in the triploids five trivalents, ten bivalents and one univalent were observed, moving to the pole at random. In the tetraploid there were 5 or 6 quadrivalents and 10 or 12 bivalents.

381. RAMIAH, K.

633.18:576.312.35

L'impiego del metodo "smear" nel calcolo dei cromosomi del riso (*O. sativa*). [The use of the smear technique in chromosome counts in rice (*O. sativa*).]

G. Riscolt. 1934 : 24 : 146-47.

English form previously abstracted in "Plant Breeding Abstracts" Vol. III, Abst. 567.

382. MORINAGA, T. and FUKUSHIMA, E.

633.18:576.356.52

Cyto-genetical studies on *Oryza sativa* L. I. Studies on the haploid plant of *Oryza sativa*.

Jap. J. Bot. 1934 : 7 : 73-106.

Seven haploid plants found among the progeny of varietal hybrids and in normal cultivated varieties since 1931 are described. They were all dwarf and highly sterile. Cross-pollination with diploids increased the fertility to 2.41 per cent and the seeds obtained developed into normal

and fertile plants. Parthenocarpic development of the caryopsis in the haploid plant was frequently observed. The growth and development of tillers of the haploid was compared with those of the diploid. A number of the haploid plants produced normal diploid tillers. Cytological studies were made on micro and mega-sporogenesis in Haploid I. Twelve univalents were generally observed but occasional bivalents occurred. The possibility of the formation of gametes with the whole haploid number was rare. Degeneration in the embryo-sac usually set in soon after the reduction divisions. The chromosomal constitution of *O. sativa* is briefly discussed and it is suggested that if *O. sativa* is a tetraploid, from the evidence presented it can hardly be regarded as an autotetraploid.

383. RAMIAH, K., PARTHASARATHI, N. and RAMANUJAM, S. 633.18:576.356.52:576.354.4
 Piante aploidi nel riso. (**Haploid plants in rice**).
 G. Risicolt. 1934 : 24 : 143-46.

English version already abstracted, see " Plant Breeding Abstracts," Vol. III, Abst. 568.

384. LIN, LIANG-TUNG, and TING, YING 633.18:581.162.5
 (**The sterile flower of wild rice of Kwangtung**).
 Agron. Bull. Coll. Agric. Sun Yatsen Univ., Publ. Ser. III, 1934 : No. 4 : Pp. 54.

To account for the sterility common in the wild rice, the morphology of the flowers, anthesis and the germinating capacity of the pollen were studied.

Not only were the pollen grains stuck together but the anthers failed to dehisce properly and germinating capacity was very poor.

Variation in sterility among the wild rice was observed and quite fertile strains have been isolated.

385. GUSTCHIN, G. G. 633.18:582
 Essai de classification botanique des riz cultivés *Oryza sativa* L. (**An attempted botanical classification of the cultivated forms of rice *O. sativa* L.**)
 Riz et Rizicult. 1934 : 8 : 1-46.

Various existing classifications are reviewed and the value of the taxonomic and botanical characters of the plant as a basis for classification is examined. Three main groups according to length and thickness of the grain are finally proposed.

386. GUSTCHIN, G. G. 633.18:582
 Saggio di classificazione botanica dei risi coltivati *Oryza sativa* L. (**An attempted botanical classification of the cultivated forms of rice, *O. sativa* L.**)
 G. Risicolt. 1934 : 24 : 191-212, 221-35.

A slightly abbreviated Italian version of the preceding paper.

387. SHEN, LI-YING 633.18-1.421
 Statistical analysis of a blank test of rice with suggestions for field technique.
 Agricultura Sinica 1934 : 1 : 107-50.

In a blank trial with early rice at Wufu, Chekiang, China in 1931, the field arrangement is such that the harvest results may be analysed for single-unit plots, two-unit plots (by combining the single-unit plots in twos), three-unit plots and so on. The analysis is done by investigating the probable errors, the land efficiency, and the effect of using different numbers of replications, of these different sized plots. The analysis of variance is also used and the standard errors obtained after eliminating fertility differences in blocks. All calculations are given in detail with numerous tables for comparing the results. From these the writer has been able to make inferences concerning the best size and shape of plot with requisite number of replications for rice experiments, with a word also on the optimum lay-out of such experiments. G. B. L.

LEGUMINOUS FORAGE PLANTS 633.3

388. BIER, A. 633.367:576.16
Versuche, verschiedene Pflanzenarten ineinander überzuführen und neue Arten und Rassen zu erzeugen. (**Attempts to transmute various plant species and to produce new species and races**).
Züchter 1934 : 6 : 181-92.

Full particulars are given of numerous instances in which, as a result of delayed germination, plants with the main characteristics of *Lupinus polyphyllus* and others typical of *L. angustifolius* arose in a population of *L. luteus*.

The yellow lupin seed originally sown was over 50-60 years old but shewed a germination capacity of 100 per cent. The appearance of the *polyphyllus* and *angustifolius* types was either sudden or gradual and transition stages as regards both plant and seed characters were observed.

No explanation of the findings is offered yet, but in the author's opinion the results were not due to mutation, since (1) a whole group of specific characters were changed and the plants obtained bred true and exhibited no subsequent atavism to the yellow species; (2) the species involved do not cross or do so with difficulty only in the case of the yellow and blue species. The name transmutation is therefore given to the phenomenon.

The possibilities of developing new races or varieties by utilizing similar conditions are considered and further work on the whole problem is contemplated.

Other methods of inducing transmutation have so far failed.

ROOTS AND TUBERS 633.4

389. LIPPMANN, E. O. VON 633.41:576.16
Nachträge und Ergänzungen zu der Festschrift : "Geschichte der Rübe (*Beta*) als Kulturpflanze." [**Additions and supplements to the memorial volume "History of beet (*Beta*) as a cultivated plant."**]
Z. Ver. dtsh. Zuckerindustr. 1934 : 84 : 15-67.

Since the appearance ten years ago of the author's work on the origin of *Beta* as a cultivated plant much new material has accumulated. In the form of notes to the various chapters, this is here presented, since the publication of a second edition is not possible. Starting from the early writings of India, Egypt, Greece and Rome, references to beet are mentioned and discussed, leading to similar sections on later centuries in Europe. In reviewing the evidence on the origin of cultivated beets it is concluded that this has come about in a number of different places independently, leading to at least three, and probably five to six distinct groups.

Brief sections on similar lines are dedicated to *Brassica*, *Atriplex* and *Daucus Carota*, all of which are frequently confused with beet in the ancient writings.

390. 633.41:576.16:578.08
SCHNEIDER, F. 633.63:576.16:578.08
Identifizierung anonym gegebener morphologisch ähnlicher Sorten von Zucker- und Futterrüben. (**The identification of anonymous and morphologically similar kinds of sugar and fodder beets**).
Züchter 1934 : 6 : 147-49.

This paper gives further details of the technique already outlined (see "Plant Breeding Abstracts," Vol. IV, Abst. 1007).

The difficulties in using leaf or root characters or even the two combined for the identification of varieties of forage beets are pointed out. If however, the bolting tendency is also included successful identification can often be made.

Comparisons of the yield performance and dry matter content from carefully planned and arranged lay-outs and replications provide a means for the identification of otherwise morphologically similar varieties. The arrangement of the varieties in groups according to the percentage of bolting observed over a three year period provides a means for the identification of the extreme sorts and others can in some cases be identified by the use of morphological characters.

In one variety of sugar beets it was found that less than one per cent of the embryos shewed a green colour while the variety with the next lowest percentage shewed 8 per cent and others up to 30 per cent.

Hence the difficulties of identification make it necessary that careful observations should be made during the whole of the vegetative period.

391.

SCHEIBE, A.

Über die Wildzuckerrüben Anatoliens *Beta lomatogona* F. et M., *B. intermedia* Bge. und *B. trigyna* W. et K. (The wild sugar beets of Anatolia, *B. lomatogona* F. et M., *B. intermedia* Bge and *B. trigyna* W. et K.)

Angew. Bot. 1934 : 16 : 305-49.

633.41-1.524

633.41:575.127.3

The systematics of the three species are first discussed, as a result of which the conclusion is reached that *B. intermedia* is in all probability a hybrid between the other two species, being in character nearer to *B. lomatogona* than to *B. trigyna*. Remarkably high sugar percentages have been observed in *B. lomatogona* and the hybrid species, in some cases rising to over 30 per cent, very much higher than any yet found in *B. maritima* and other wild forms or even in *B. vulgaris*. They are, moreover, highly frost and drought-resistant and tolerant of salty soil and the "roots" are white in colour, all of which give them a high value as breeding material. The deep roots, a certain tendency to branching, to seed germination and to a perennial habit are mentioned as defects, though the unusual plasticity of the genus *Beta* and analogy with other species of cultivated plants lead the author to believe that these defects could be overcome by appropriate selection. The indications are that flowering occurs every three years in the majority of forms and this combined with their pronounced frost-resistance suggests the possibility of their use for breeding forms suitable for winter sowing in arid zones having a very short growing season. The chromosome number of *B. lomatogona* and *B. intermedia* is not yet known; by analogy with *B. trigyna* however it is likely to be 27 (n). It is therefore unlikely that hybridization with *B. maritima* and *B. vulgaris* (n = 9) will lead to any great practical success.

The wild species, especially *B. lomatogona* and *B. intermedia*, show signs of being resistant to *Cercospora beticola* and possibly also to the insect *Pegomyia hyoscyami*.

The local inhabitants use the leaves of these beets as a vegetable but the remarkable possibilities of the material for breeding new sugar beets seem hitherto not to have been appreciated.

392.

COLIN, H. and BOUGY, E.

633.416:575.127.2:633.63:575.11

L'hybridation des betteraves sucrières et fourragères. (The hybridization of sugar and forage beets.)

Publ. Inst. Belge Amélior. Better. 1934 : 2 : p. 100. (Abst.)

In a careful study of crosses between sugar and forage beets the authors found that the products obtained in both direct and reciprocal crosses have always a proportion of sugar greater than the mean of the parents cultivated under the same conditions. Other characters such as total nitrogen ash, etc. behave in the same way. The sugar beet characters are therefore on the whole dominant rather than recessive.

On the other hand if the forage beet parent is poor in sugar the forage-sugar hybrid resembles the sugar beet parent more closely than does the reciprocal.

393.

RATHLEF, H. VON

633.491(43)

Das jetzige deutsche Kartoffelsortiment, seine hauptsächlichsten Merkmale und die verwandtschaftlichen Beziehungen seiner Sorten. (The present German potato collection, its chief characters and the relationships of the varieties.)

Die Kartoffel 1934 : 14 : 103-07.

The standard collection of German potato varieties has recently been revised and reduced and for the benefit of the breeder the main characters of the remaining sorts are given and a genealogical tree of their relationships. In addition the 9 original varieties, from which most of the rest have originated, are briefly described.

394.

STEVENSON, F. J.

633.491:575

" What's inside the potato."

Amer. Pot. J. 1934 : 11 : 229-34.

A popular article in which the ideas of genetic constitution, mutation and hybridization are exemplified with reference to the potato. The rarity of mutation as a source of new varieties, disease resistance and the collection of wild forms for use as breeding material are also dealt with in general terms.

395. BERKNER, F. 633.491-2.3-1.521.6
Eisenfleckigkeit bei Kartoffeln. Wesentliche Sortenunterschiede—Abhängigkeit
der Befallstärke von Jahreswitterung und Boden. (**Spraying in potatoes.**
Essential varietal differences—dependence of severity of attack
upon the year's weather and on the soil.)
Mitt. Landw. 1934: 49: 378-80.

Over 218 varieties were tested for resistance during four years. Relatively few sorts proved resistant (e.g. only 6 out of 85 in the wart resistant group) and varietal differences were marked. The breeding of immune varieties is essential.

396. 633.491-2.411.4-1.521.6
633.491-2.411.4:576.16
Sitzung vom 27 Juli 1934. (**Meeting 27th July, 1934.**)
Ber. dtsch. bot. Ges. 1934: 52: 373-77.

At a meeting of the Deutsche Botanische Gesellschaft Herr Dr. K. O. Müller read a paper on recent developments relating to phythophthora resistance in potatoes and the problem of physiological races of the pathogen (see "Plant Breeding Abstracts," Vol. I, Abst. 213, Vol. III, Absts. 236 and 673).

397. 633.492
633.492:575(47)
ALEXEYEV, V. P.
(**The sweet potato.**)
Bull. Appl. Bot. Leningrad 1934: Ser. A (9): 115-22.

An account of the work done on the sweet potato since its introduction in 1930. Improved varieties have been selected in respect of keeping quality, yield, form and disposition of tubers and cooking quality. Hybridization work is now in progress.

FIBRES 633.5

398. DEWEY, L. H. 633.5
Bibliografia selecta sobre plantas fibrosas. (**Selected bibliography on fibre**
plants.)
Union Panamericana, Washington, D.C., 1933: Pp. 10.

A miscellaneous collection of 100 references to Spanish and other literature mainly on the cultivation and economic aspects of fibre plants in various countries with occasional references to disease and technological studies.

399. 633.51 Kolkhoznik
633.51:575(47)
KOLOJAROVA, L.
(**Agronomic qualities of the new cotton variety "Kolkhoznik."**)
Bor'ba za khlopok (Cotton Campaign) 1934: No. 4: 69-74.

The variety No. 8517, now named Kolkhoznik, was produced at the Central Breeding Station of the SredazNIHI in 1928 by selection from Acalá No. 0278. It was handed over for multiplication in 1930 and now occupies 50,200 ha. It is 1-2 days later than Navrotskii in beginning to bear but produces its bolls more rapidly and so completes its yield earlier. It exceeds Navrotskii in yield of raw material by 5-10 per cent, in yield of lint by 15-20 per cent. Its lint length in 1933 was 29-31, 2-3 mm. above Navrotskii, the average excess for the period 1932-1934 for all stations being 3.1 mm. The average weight of the bolls was 120-130 g. compared with 123.1 g. for Navrotskii, though the weight of seeds was slightly lower than in Navrotskii. The lint is strong, soft and silky and the combination of length and ginning percentage in this variety is more favourable than in any of the other varieties tested, both properties being notably in excess of Navrotskii. There is every reason why it should replace Navrotskii, though at present it is still apt to segregate slightly and requires further purification.

400.

UČEVATKIN, F.
(A variety that will replace Navrotskii.)

633.51 Kolkhoznik
633.51:575(47)

Bor'ba za khlopok (Cotton Campaign) 1934 : No. 1-2 : 115-17.

A lint length of 24-26 mm. has hitherto been regarded as satisfactory but the second Five Year Plan puts the minimum at 29. The popular variety Navrotskii no longer fulfils this requirement and new highly productive selections with longer lint are being tried out. One, No. 8517, Kolkhoznik, a selection from Acalá released in 1928, has in the intervening period justified its producers' high expectations. It outyields Navrotskii by 20-25 per cent, and exceeds it in ginning percentage by 3-4 per cent and in lint by 3-4 mm. The quality of the lint and size of bolls is also greater.

Though under too rich conditions of growth it tends to lodge, it will, under optimum conditions, produce up to 25-27 centner without doing so, owing to a strong fibrous layer, which is not so pronounced in Navrotskii. In 1933 it exceeded Navrotskii by 3.6 c. per ha. (i.e. 24.1 per cent), though in order to do this it requires a greater number of irrigations.

The spinning qualities are superior to those of Navrotskii, which variety it is expected to replace.

401.

PIŠČUGIN
(New varieties of cotton in the Fergana Valley.)

633.51:575(47)

Bor'ba za khlopok (Cotton Campaign) 1934 : No. 5 : 65-68.

The variety No. 8517 "Kolkhoznik," a selection from Acalá released in 1928, has in the intervening period justified its producers' high expectations. It outyields Navrotskii by 20-25 per cent, and exceeds it in ginning percentage by 3-4 per cent and in lint length by 3-4 mm. The quality of the lint and size of bolls is also greater.

The results of field tests are given which illustrate this and also shew that the superiority of the new strain is more pronounced in the places with the best cultural conditions. It is more affected by excessive or deficient water supply.

Kim No. 2017 and an Egyptian selection, Pima Ferganskii, also gave very promising results.

402.

STROMAN, G. N.
Cotton breeding investigations 1928 to 1932.

633.51:575(78.9)

Bull. N. M. Agric. Expt. Sta. 1934 : No. 217 : Pp. 39.

The work of selection of improved strains of cotton undertaken by the New Mexico Agricultural Experiment Station with the main object of improving the quality of the lint and in particular of securing uniformity of length is described.

At first uniformity was measured by the range in length of lint within the progeny, but later the sorter method was used.

The question of seedling vigour was also investigated and considerable variation was observed. The progeny of one family shewed outstanding results with regard to length and uniformity. The work is being continued.

403.

WARE, J. O.
Genetic relations of Nankeen lint to plant color and leaf shape in Upland cotton.

633.51:575.11
633.51:575.11.061.6

Bull. Ark. Agric. Expt. Sta. 1934 : No. 300 : Pp. 44.

Seventeen crosses were made between plants with Nankeen lint ♀ and with red plant colour and okra leaf shape. Some of the progenies were continued into the F_4 and back-crosses were made with the parental types Nankeen, red okra leaf, green okra leaf and winesap. The detailed statistical data include the application of the χ^2 test and the calculation of the probability values corresponding to the obtained χ^2 values. The results shewed clearly that each character is monofactorial and is independently inherited.

404. MOORE, J. H. 633.51:575.2:677.21:578.081
The value of single lock samples as a measure of seed purity in cotton.
 J. Amer. Soc. Agron. 1934 : 26 : 781-85.

The inheritance of combed staple length, based on the random selection of a single lock from each parent plant was studied in order to determine the accuracy of this method in measuring variability of length within a variety of cotton. Four American Upland strains (*Gossypium hirsutum* L.) with varying degrees of variability of combed staple length served as material. The data from one season's observations shewed that the method in question was reasonably accurate. It was, however, also clear that, in view of the fortuitous fluctuations that occurred in the parent samples, the method as applied to the performance of individual plants within a variety of cotton has its limitations in the measurement of combed staple length variation.

405. TERADA, S. and HORIO, S. 633.51:575.242.061.1
(On the mutating snaky cotton plant).
 J. Soc. Trop. Agric. Formosa 1934 : 6 : 4-6.

The mutants which occurred in 1933 in Upland cotton differ only morphologically and not in vegetative growth characteristics, time of maturity or yield, from the original strain from which they are derived. The main feature of the anomaly is waviness of the cotyledons and young leaves and of the hypocotyl.

406. WEBBER, J. M. 633.51:576.312.35
 633.51:576.354.4:576.16
Chromosome number and meiotic behavior in *Gossypium*.
 J. Agric. Res. 1934 : 49 : 223-37.

This paper deals with the chromosomal composition of the gametes produced by the multitudinous forms of cotton and with the interpretation of meiosis within groups of species rather than individuals or forms.

The haploid chromosome number 13 for all Asiatic cottons, for wild American species and for *G. sturtii* was confirmed, as was also 26 as the haploid number for all cultivated American cottons. Evidence is presented shewing that the chromosomes within a cotton species are heterogeneous in shape and very nearly equal in size.

The question of the possible tetraploid nature of the species with 26 pairs of chromosome is mooted and reasons for the apparent absence of aneuploid individuals in cotton are considered. The writer inclines to believe that aneuploids do occur but have not been recorded.

407. WEBBER, J. M. 633.51:576.356.7:575.127.2
Cytogenetic notes on cotton and cotton relatives.
 Science 1934 : 80 : 268-69.

In the F_1 of some hitherto unrecorded interspecific hybrids between the American cultivated and wild species the chromosome complement at reduction division was 13 pairs and 13 single chromosomes; in hybrids between cultivated American species and *G. sturtii* from 0-4 pairs with from 21-39 single chromosomes were found and in hybrids between wild American species and *G. sturtii* 26 single chromosomes. In addition, hybrids between *G. sturtii* and *Thurberia thespesioides* ($n = 13$) have been found to exhibit 26 single chromosomes at first metaphase. These new findings are taken as indicating the allopolyploid nature of American cultivated cottons.

408. BALLARD, W. W. 633.51:581.162.3:578.08
A new method of self-pollinating cotton.
 Circ. U.S. Dept. Agric. 1934 : No. 318 : Pp. 4.

A method for the self-pollination of the cotton flower by means of paper cones is described. This has definite advantages over either the rubber band or clip or the paper bag method previously in use.

409. DOAK, C. C. 633.51:581.162.3:578.08
A new technique in cotton hybridizing. Suggested changes in existing methods of emasculating and bagging cotton flowers.
J. Hered. 1934 : 25 : 201-04.

A criticism of the present method of emasculating cotton is followed by an illustrated description of an adaptation of Buchholz and Blakeslee's technique for *Datura* to the cotton plant. The new method (which is in regular use at the Station for Experimental Evolution at Cold Spring Harbour) consists essentially in the removal of corolla and androecium in one piece. The advantages of using a lemonade straw, closed at one end and fitting tightly round the ovary instead of the usual bag to protect the flower are demonstrated.

410. REYNOLDS, E. B., KILLOUGH, D. T. and VANTINE, J. T. 633.51-1.421
Size, shape, and replication of plats for field experiments with cotton.
J. Amer. Soc. Agron. 1934 : 26 : 725-34.

Two similar blank experiments on cotton, one at College Station, Texas and the other at Chilledale, Texas were carried out in 1931 and 1932 respectively. The analysis of variance technique is used in the interpretation of these results, and tables are given which compare the standard errors of the means of plots of different size and shape, the efficiency of such plots and the estimated number of replications of such plots required to give certain postulated standard errors. Studies on the size of plot from these data (a) assuming a constant experimental area and (b) assuming a constant number of replications, yield fairly conclusive evidence concerning the most efficient size and shape of plot for cotton experiments. Two graphs give the relation between the actual and the theoretical effect of different numbers of replicates at the two centres, indicating what the minimum number of replications should be.

G. B. L.

411. WARE, J. O. and YOUNG, V. H. 633.51-2.484-1.521.6:575
Control of cotton wilt and "rust." 633.51-2.19-1.811.3
Bull. Ark. Agric. Expt. Sta. 1934 : No. 308 : Pp. 23.

The wilt-resistance quality of a number of varieties, both those developed by the Arkansas Agricultural Experiment Station and others, were determined and further data obtained on the relation of manures to the incidence of cotton wilt and the disease known as "rust" or potash hunger (see "Plant Breeding Abstracts," Vol. II, Abst. 657).

It was found that if amounts of potash sufficient to control "rust" were applied, there was a marked reduction in cotton wilt but that unless the potash was used as part of a complete fertilizer there was a reduction in yield.

412. KEARNEY, T. H. 633.51:677.21:576.312.35
American wild cottons with thirteen chromosomes. 633.51:576.16
J. Hered. 1934 : 25 : 305-12.

It has recently been discovered (see "Plant Breeding Abstracts," Vol. III, Absts. 575 and 676) that the lintless wild species of cotton *Gossypium Stocksii* Mast., *G. sturtii* F. v. M., and the American forms *G. klotzschianum* Anderss., *G. davidsonii* Kellogg, *G. Harknessii* Brandeg and *G. armourianum* Kearney possess the smaller chromosome number ($n = 13$) of the Asiatic cultivated cottons, though none of them except *G. Stocksii* resembles them morphologically. Of the 13-chromosome species some have lint and others have not, but no lintless species is known with 26 chromosomes.

The morphological and physiological features of the four American lintless species are defined and a key to their distinguishing characteristics is appended.

The West Australian *G. sturtii* seems to be distantly related to the American lintless species, whereas *G. Stocksii* from the Persian Gulf region shews little resemblance to the American and Australian species and appears to be a possible collateral ancestor of the cultivated Asiatic forms.

The validity of including *Thurberia thespesioides* Grey in the genus *Gossypium* is considered, (see "Plant Breeding Abstracts," Vol. II, Abst. 101). In the author's opinion *Thurberia* is not entitled to rank higher than a sub-genus, though its status cannot be definitely fixed until the classification of the *Malvaceae* as a whole has been critically revised.

413. RUSANOV, F. N.

633.512-1.524

(**The wild *Apocynum* of Eurasia.**)

Trudy Inst. Novogo ljubjanogo syr'ja. (Bull. Bast. Fibres Res. Inst. Moscow) 1933: 7: Pp. 112.

The author refers to *Apocynum venetum*, a wild plant which has been successfully taken into cultivation; yet plantations of it still present a countless variety of forms and the best cultural measures for the plant, adapted as it is to the rigorous conditions of wild growth, have still to be discovered. Various expeditions have been sent to study the conditions under which it grows in the wild state and have at the same time disclosed the existence not only of a great number of varieties but of a number of distinct species of the genus.

The variation observed in the characters of the vegetative and reproductive organs is analysed and a number of geographical races established, some of which are given the rank of new species and described.

Extensive consideration is given to the ecology of the wild *Apocynum* and to the geographical distribution of the species, especially in so far as this affords an indication of the area of its possible cultivation. Though direct evidence on the origin of *Apocynum* is lacking, various arguments are adduced to indicate that it is a relic of a pre-pleiocene genus widely distributed in the region of the present Siberia. In spite of this there is no reason to suppose that the region of its cultivation may not be extended greatly beyond its present area of distribution by the application of suitable cultural measures.

There is considerable difference in the fibre produced by the different races, a subject to which further study is now being devoted. Similar differences are observed in adaptability to various climatic regions, it being not uncommon to find that a race thrives better in a region to which it is introduced than in its native habitat.

Considerable segregation was observed in the seed progeny of a single plant, both in morphological and ecological characters. Thus no small amount of cross-pollination takes place and this accounts for the wealth of existing forms, representing an admirable material on which to start breeding operations.

414. SCHILLING, E.

633.52:575(43)

Zur Lage der deutschen Flachsziichtung. (**The position of German flax breeding.**)

Faserforschung, 1934: 11: 7-12.

Flax cultivation in Germany has quite suddenly increased again and breeders are faced with the problem of producing enough seed, especially of the cheap type formerly imported from Russia.

Among hints for profitable lines of breeding the author mentions the possible success of a compromise between the demands of the spinning and oil industries and production of a dual-purpose seed flax; the necessity of breeding for standing capacity and resistance to disease, early maturity, tolerance and adaptation to particular climatic regions. The development of new chemical methods of retting will probably make it necessary to breed types suited to this, and also types suitable for cottonization.

415. HOBUSCH, L.

633.52:575.127.2:575.182

Untersuchungen über die Kreuzungsschwierigkeiten bei den Bastarden zwischen *Linum austriacum* und *Linum perenne* und deren Nachfolgenerationen. (**Investigations on the difficulties in crossing in the hybrids between *L. austriacum* and *L. perenne* and their subsequent generations.**)

Z. induct. Abstamm.-u. VererbLehre 1934: 67: 389-434.

A complex series of back-crosses was made in order to determine the effect of different proportions of the genomes of the parents on the set of seed, seed development, seed quality and the physiological reactions of such seeds.

The general conclusion reached was that the number and general vitality of the sound seeds and the resistance of the seedlings of any one combination increased with the degree of genotypical resemblance to the two parents and further that genotypically equivalent combinations produced better sets of seed, better seeds with higher capacity for germination and development as well as seedlings of higher resistance, if the larger seeded form was the maternal parent.

A study of the segregation in the various hybrid generations shewed that the elimination of certain types occurred. It is concluded that this takes place first in the zygote stage or later and that such elimination is due to the effect of the mother plant on the seeds of certain constitutions and is not a case of genotypically induced lethal conditions.

416. MINAMI, T. and KIKUCHI, M. 633.52-2.484-1.521.6:575(52)
(On the wilt resistant varieties of flax.)
Proc. Crop Sci. Soc. Japan 1934 : 6 : 107-17.

A strain of flax highly resistant to wilt has been isolated at Hokkaido University Agricultural College. It is regarded as homozygous for resistance and in cultivation during a series of years its resistance shewed a tendency to increase as long as climatic conditions were favourable. Except in wilt resistance, the strain is somewhat inferior to other varieties ; but a genetic study of its property of resistance should prove profitable.

417. MEDVEDEVA, G. B. 633.522:576.354.4:581.331.2
(On the cytology of hemp. Pollen development in Italian hemp.)
Trudy inst. novogo lubjanogo syr'ja. (Bull. Bast Fibres Res. Inst. Moscow)
1934 : 6 : 34-54.

The Russian version of the article referred to in " Plant Breeding Abstracts," Vol. V : Abst. 127.

418. BRESLAVETZ, L. P. 633.522:576.356:631.541
(Abnormalities in pollen development in different varieties and grafts of hemp.)
Trudy inst. novogo lubjanogo syr'ja. (Bull. Bast Fibres Res. Inst. Moscow)
1934 : 6 : 55-67.

Examinations were made of the pollen mother cell development of a number of varieties of normal hemp plants and innumerable irregularities discovered, so much so that the sight of a regular tetrad was a comparative rarity. Grafts were made of plants of opposite sex and the pollen mother cells examined in the grafted plants ; similar irregularities were observed, beginning even in the archesporial tissue. Two and up to three nuclei were observed in one pollen mother cell and the reduction division was more irregular even than in the normal varieties, leading also to greater irregularities in the size and shape of the pollen grains ; all pollen grains proved " good " however in the sense that they swelled in water. Preliminary experiments also indicated that grains of all sizes were viable. Further experiments are to be directed to the utilization of the giant pollen grains in the hope of obtaining polyploids and the author alludes to the further possibility that the polyploid forms, when they are produced, may be hermaphrodite.

419. MEDVEDEV, P. F. 633.525.1:581.162
(On the biology of development and flowering of ramie.) 633.525.1:575.127.2
Bull. Appl. Bot. Leningrad 1934 : Ser A (9) : 123-35.

A brief description is given of the morphology of the plant, followed by more detailed descriptions of the male and female flowers at the various stages of development and of the biology of fertilization. Though the plant is normally cross-pollinated, mainly by wind, yet inbreeding is possible. This together with the pronounced capacity of the plant for vegetative reproduction should make the selection of improved strains a matter of comparative ease.

Various crosses have been made, including crosses of Formosa ramie by wild Japanese, by Java and by Moroccan forms and of Java by Chinese forms.

Successful crosses have also been made of *Boehmeria platiphylla* by *B. nivea*, *B. biloba* and *Urtica dioica*, of *B. cylindrica* by *B. nivea* and *B. biloba* and of *B. nivea* by *U. dioica*. No seeds were obtained from *B. nivea* x *B. biloba*.

SUGAR PLANTS 633.6

420. M(ANGELSDORF), A. J. 633.61.0014(96.9)
Notes on new varieties.
Hawaii. Plant. Rec. 1934 : 38 : 31-32.
Tests of the new seedlings 28-1234 (P.O.J. 2364 x 26 C 270) and of 31-1389 (P.O.J. 2878 x 26 C 270) with existing varieties gave very promising results. The first named is recommended for trial under all conditions except where eye-spot disease is severe ; the second new variety is highly resistant to this disease and yielded juice equal to or better than the control varieties.
421. 633.63:575
633.63-2-1.521.6:575
633.41:575.127.2
BRANDES, E. W. and COONS, G. H.
Beet crop problems : science helps find the answers. The beet research work of the United States Department of Agriculture and how it aims to aid the producer.
Facts ab. Sug. 1934 : 29 : 83-85, 117-21.
Inter alia the work of the Division of Sugar Plant Investigations is described. Relevant publications have been reviewed in " Plant Breeding Abstracts," Vol. IV, Abst. 1009, Vol. V, Abst. 132.
The existence of physiological strains of the *Rhizoctonia* organisms parasitic on sugar beets is announced and its importance in breeding for disease resistance mentioned.
Promising results have been obtained in breeding for leaf-spot resistance by continued selection for resistance among inbred lines. Marked uniformity has been attained in regard to foliage and root characters as well as resistance, and the decrease in vigour and size due to inbreeding is counteracted by crossing. The synthetic varieties obtained by combining disease resistant lines are to be tested on a large scale in 1934.
Investigations with *Beta maritima* L. have shown that wild strains may shew greater resistance to leaf-spot than cultivated beets and also that mass selection under epidemic conditions offers a means of markedly improving resistance in beet. Crosses with wild beets usually resulted in a marked increase in size, roots from 5-7 lbs. weight being not uncommon.
Biochemical research on the nature of curly-top resistance are beginning to reveal differences in resistant strains as compared with susceptible ones. The results of breeding for curly-top resistant lines have been briefly recorded elsewhere (see " Plant Breeding Abstracts," Vol. IV, Abst. 210).
Tests of promising varieties and strains for their adaptability to various regions in the United States are also being carried out.
422. 633.63:575
633.63:576.356.5
SCHNEIDER, F.
Neue Gesichtspunkte für die Zuckerrübenzüchtung. (New directions for sugar beet breeding).
Zbl. Zuckerindustr. 1934 : 42 : 355-56.
In outlining the achievements of sugar beet breeding since its inception over one hundred years ago reference is made to the production of non-bolting strains by means of inbreeding. Early sowing tends both to reduce bolting and increase the yield. Observations at Kleinwanzleben have indicated that the capacity to make use of large quantities of manurial elements is a hereditary character and can be introduced into a variety with the result that higher productivity is attained without the usual loss in sap quality. Definite hereditary differences in power to utilize phosphorus have been demonstrated, and similar differences in salt content seem also to exist.
Races resistant to various diseases have been produced by selection and breeding and special attention is now being given to breeding for nematode resistance.
At Kleinwanzleben somatic cells with polyploid divisions have been observed, namely chromosome numbers of 36 and 54. Also successful crosses have been made with the triploid *Beta trigyna*, though the degree of fertility of the hybrid is not yet known.

423. BUSZCZYNSKI, B. 633.63:575.11
Contribution à l'étude de l'hérédité des caractères : richesse en sucre et poids chez la betterave sucrière. (**Contribution to the study of the heredity of the characters : richness in sugar and weight in the sugar-beet.**)
Publ. Inst. Belge Amélior. Better. 1934 : 2 : p. 102. (Abst.)

In order to appreciate the results of selection starting from selfed beets, the author allowed the beets to seed in isolation and sowed the seed of the individual plants in comparative tests. The results (not shown in the abstract), give the correlation between the weight of the individual beet and the yield of its progeny on the one hand and the richness of sugar on the other.

424. BORMANS, M. F. 633.63:575.42
Les méthodes de sélection de la betterave à sucre et la génétique. (**The methods of sugar-beet selection and genetics.**)
Publ. Inst. Belge Amélior. Better. 1934 : 2 : p. 99. (Abst.)

The author mentions the lack of co-ordination which frequently exists between the seed producers and the sugar manufacturers, often due to ignorance of the biological laws of selection. Methods of selection are reviewed and those which take into account the laws of heredity are specially considered.

With regard to the question of bolting in the first year, the conclusion is reached that this complex character is in a state of unstable equilibrium and that the isolation of annual and biennial types, although difficult, is more or less possible according to the geographical condition under which selection takes place.

The last chapter deals with selection in relation to environment and in particular to the difficulties encountered with such diseases as *Cercospora* against which the creation of immune strains has seemed, up to the present, impossible.

425. DECOUX, L. 633.63:575.42
Possibilités nouvelles d'amélioration de la betterave sucrière. (**New possibilities in the improvement of sugar beet.**)
Publ. Inst. Belge Amélior. Better. 1934 : 2 : 79-98.

Since 1850, when selection of the sugar beet was first undertaken by Vilmorin, the sugar content has been increased from 9.8 per cent in 1848 to 17.6 per cent in 1914 and the average weight of the roots from 354 g. to 467 g. Since 1914 there has been little progress but the competition with cane sugar has made it necessary to reconsider the problem and the International Institute for Sugar Beet Research has been formed for this purpose. The maximum limit of yield in the sugar beet has been worked out by O. W. Willcox as 120 tons per ha. (weight of root without crown) and the yield will increase with the number of beetroots as long as these do not exceed a density of 265,000 plants per ha. It is, however, doubtful whether these figures have any practical significance. The difficulties and possibilities of further improving sugar beet by selection are discussed, including the increase of both sugar content and weight, reducing the ash content, eliminating bolting, the nitrogen content, etc. The importance of a knowledge of the cytology of the sugar beet is indicated and also the possibilities offered by hybridization.

426. DUDOK VAN HEEL, J. P. 633.63:575.42
L'amélioration de la betterave par la sélection génétique. (**The improvement of sugar-beet by genetical selection.**)
Publ. Inst. Belge Amélior. Better. 1934 : 2 : 99-100. (Abst.)

Selection of the sugar-beet is as old as the sugar industry itself. The methods employed by Kuhn and Co. of Naarden, Holland are described.

A study of the origin of the sugar-beet shews that most probably all have descended from a very few plants which explains why so little progress has been made by selection during the last twenty years. Crosses with wild beets would remedy the situation. New possibilities have been opened for the better utilization of existing races using the curves worked out by van Ginneken.

The greatest progress in the production of sugar per hectare will be by improved methods of cultivation.

427. MUNERATI, O. 633.63:575.42
De l'insuffisance des doctrines actuelles de génétique pour l'explication du mécanisme de l'hérédité de la betterave à sucre. (**The inadequacy of the present theories of genetics for the explanation of the mechanism of the heredity of the sugar beet.**)
Publ. Inst. Belge Amélior. Better. 1934 : 2 : 73-78.

The author points out some of the difficulties encountered by those attempting to improve the quality of sugar beet by selection and suggests that the known laws of genetics do not offer a satisfactory explanation and that therefore the breeder has nothing to guide him in his work.

428. VONDRAK, J. 633.63:575.42
633.63:551.56
Sur les changements de la composition de la betterave provoqués par les conditions climatiques et par la sélection systématique. (**On the changes in the composition of the sugar-beet brought about by climatic conditions and by systematic selection.**)
Publ. Inst. Belge Amélior. Better. 1934 : 2 : 100-01. (Abst.)

It has been found that there is a fairly definite relation between the amount of rainfall and the amount of nitrogenous matter in the beets and in the juice. Besides such regular changes in the composition of the sugar-beet the results of systematic selection can be observed in the increase in sugar content, etc., of the juice of beets grown in Bohemia during 20-30 years.

429. SPENGLER, O., BÖTTGER, S. and LINDNER, L. 633.63:581.192:575
Untersuchungen über die Verarbeitungsfähigkeit verschiedener Zuckerrübensorten (2. Mitteilung). [**Investigations on the workability of different sugar beet varieties. (2nd Contribution).**]
Z. Ver. dtsch. Zuckerindustr. 1934 : 84 : 365-99.

Analyses at Kleinwanzleben have shewn nitrogen content and proportions to be constant hereditary varietal characteristics.

The attention of breeders whose object is the production of strains most suitable for factory use is drawn to the finding that the content of "harmful" nitrogen in beet is the surest criterion of its satisfactory workability and is easily ascertained and of greater practical significance than the ash content. The figures shew that it is not correlated with sugar content.

430. ROSNOWSKI, M. S. 633.63-1.547.4
Une des causes de la montée en graines de la betterave pendant la première année. (**One of the causes of bolting in the beet during the first year.**)
Publ. Inst. Belge Amélior. Better. 1934 : 2 : p. 102. (Abst.)

Taking as his hypothesis that the external conditions of the flowering stems may influence the formation of seed and consequently the development of the beet itself, the author made a number of experiments by growing the plants under different conditions.

The conclusion is reached that the whole biennial cycle of development must be taken into consideration in dealing with the question of bolting.

431. LOMA Y DE OSEYZA, J. L. DE LA 633.63-2.484-1.521.6
L'obtention de variétés de betteraves résistantes au Cercosporé par sélection génétique. (**The production by genetical selection of varieties of beets resistant to Cercospora.**)
Publ. Inst. Belge Amélior. Better. 1934 : 2 : p. 103. (Abst.)

Varietal tests have established the existence of a Polish variety resistant to *Cercospora* without any decrease in yield of sugar, of roots and leaves.

STIMULANTS 633.7

432. CHRISTOFF, M. 633.71:575.11.061.634
(Inheritance of albino-seedling in *Nicotiana glauca*.)
 Annu. Univ. Sofia 1933 : 11 : 645-60.

In a line of *N. glauca* the author observed white seedlings. He made crosses between the green sister plants and found a segregation of approximately 3 : 1, the chlorophyll deficiency being due to a single Mendelian gene. In one cross (No. 10) however, between a "heterozygous" and a "homozygous" plant he obtained a segregation of 135 green and 37 white, which is undoubtedly due to experimental error, if the first statement was right. The author's interpretation of the origin of the heterozygous line is in contradiction to recent conceptions of gene mutations. He believes that the appearance of albinism in *N. glauca* is due merely to inbreeding. The "propagation within a self-sterile species such as *N. glauca* probably tends to produce a uniform condition of the idioplasm throughout the population, which may ultimately lead to the appearance of albinism, which has been in a latent state." One plant, No. 21, was self-fertile. The author maintains that this plant should not possess a "predisposition" to albinism, because it is self-fertile. Discussing the problem of albinism in general, the author contends that "individuals in the plant kingdom that lack chlorophyll are biologically identical with albino animals," thus disregarding the nature and the origin of the chlorophyll plastids in plants as compared with the pigment in animals.

433. OSADCHUK, E. A. 633.71:575.125
(Heterosis as a factor in the increase of tobacco yield).
 Južno-berežnoe Otdelenie V.I.R.'a Gosudarstvennyi Nikitskii Botaničeskii Sad
 (Nikita Botanic Garden) 1934 : Bull. No. 12 : Pp. 40.

The F_1 hybrids of a number of parental combinations were compared with the parents in two successive years, 1929 and 1930.

Not by any means all combinations showed heterosis; hybrids of varieties genetically closely allied were invariably intermediate, those from unrelated varieties generally showed at least an increase in height.

Descriptions are given of the varieties used as parents, followed by tables showing the yields of the parent varieties and the F_1 hybrids. The best combination, Nikitskii Dubec 44 x Sumatra Petioled, gave an increase of 33.1 per cent over the better of the two parents, the next best, American 572 x Sumatra Petioled, 26.9 per cent; each of these crosses involved a Sumatra tobacco and a local strain. Two out of the seven combinations gave negative results, i.e. reduced yield.

The same hybrids were grown on a second plot where the soil fertility was much lower and none of them showed any marked yield increases: the best combination in the first plot here gave a yield intermediate between the parents and the second best showed a decrease of 11.7 per cent in place of a 26.9 per cent increase. It is evident from this that it is necessary to test the hybrids under a variety of conditions before drawing conclusions regarding heterosis and to do this a system of tests at a series of different centres, analogous to the State variety testing systems, is regarded as necessary.

Similar studies were made on the number of leaves fit for picking. This varied very little in any one variety and the hybrids were mostly intermediate. The two most highly yielding hybrids referred to above had a greater number of leaves than the parents in both plots. The middle leaf of 50 plants of each type was measured, the length, breadth, area, form (length : breadth) and thickness of the leaves being determined. The leaf area exceeded that of the parents in several of the hybrids, in one case by 17.4 per cent. American 572 x Sumatra Petioled had actually smaller leaves though their number was greater. Only one combination was intermediate in leaf area.

The yields estimated by multiplying the number, area and thickness of the leaves in most cases corresponded fairly closely to the actual yields and this is suggested as a useful method of making yield comparisons, especially in experiments where only one variety is in use.

The yields of first, second and third quality product and degustation tests shewed that though the differences between the varieties were not great, many of the hybrids excelled their parents and the superiority was most pronounced in the combinations shewing most increase in yield. In view of this fact and the ease of effecting the crosses the use of first generation hybrids on a much greater scale is recommended. It is calculated that one trained worker can produce enough seed to sow one hectare in two working days.

434. PIESCU, A. 633.71:575.127.2
Hibridul ♀ *Nicotiana tabacum* (Molovata) x ♂ *N. glauca*. (Caracterele lui morfologice). [The hybrid *N. tabacum* ♀ (variety Molovata) x *N. glauca* ♂. (Its morphological characters).]
Bul. Cultiv. Ferment. Tutun. 1931 : 20 : 457-70.

Using the variety Molovata as the female parent crosses were made with *N. quadrivalvis*, *N. glutinosa* and *N. rustica humilis* without success. Only with *N. glauca* were hybrids produced ; their characteristics are described.

The F₂ plants were more vigorous than the parents and a certain number of characters of *N. tabacum* were dominant, others were intermediate between the parent species.

435. KOSTOFF, D. 633.71:575.127.2:576.356.2
Crossing over in *Nicotiana* species hybrids.
Cytologia 1934 : 5 : 373-77.

Contents previously reviewed in P.B.A. IV, Abst. 870.

436. KOSTOFF, D. 633.71:575.127.2:576.356.5
(Experimental production of polyploid hybrids in the genus *Nicotiana* and their significance.)
Priroda (Nature) 1934 : No. 8 : 44-49.

A popular account of the process of chromosome duplication in sterile interspecific hybrids and of various trigenom hybrids obtained from them in *Nicotiana* by back-crossing with the parental species. By further back-crossing of these hybrids various fertile hybrids with four genomes have been obtained.

Various characteristics of polyploid plants are mentioned, e.g. a greater proportion of chromatic and hence genic material to cytoplasm ; in consequence of this the physiological processes are often disturbed, which often leads also to an acceleration of the mutation process.

Special reference is made to the fertile trigenom hybrid obtained by fertilization of *N. tabacum* by unreduced pollen of the hybrid *N. sylvestris* x *N. Rusbyi*, the genomes of both these species being compatible with that of *N. tabacum*. These hybrids are cytologically stable therefore but segregate richly in later generations. Valuable segregates have been obtained in respect of leaf size, time of maturity and nicotine content and this is regarded as the most promising of all the hybrid material.

437. KOSTOFF, D. 633.71:575.127.2:576.356.5
(Polygenomous hybrids in tobacco.)
Bull. Appl. Bot. Leningrad 1934 : Ser. A (9) : 145-50.

The best use can be made of the occasional unreduced gametes formed by sterile hybrids such as *Nicotiana rustica* x *N. tabacum* by applying the pollen to pure *N. rustica*, thus giving rise to trigenom hybrids (see "Plant Breeding Abstracts," Vol. IV, Abst. 1050). By applying the pollen to a third species instead of back-crossing, trigenom hybrids with three distinct genomes can be obtained ; as for instance *N. tabacum* x (*N. sylvestris* x *N. Rusbyi*) giving *N. tabacum* 24 + *N. sylvestris* 12 + *N. Rusbyi* 12 = 48, known as *N. triplex* (see "Plant Breeding Abstracts," Vol. IV, Abst. 1052).

Further, the trigenom hybrid (*N. rustica* x *N. paniculata*) x *N. paniculata* was used to pollinate *N. rustica* and so produced a tetragenom hybrid with each maternal genom duplicated, thus an amphidiploid. The same result was obtained by pollinating (*N. rustica* x *N. paniculata*) x *N. rustica* with *N. paniculata* and by an analogous process applied to hybrids of *N. glauca* x

N. Langsdorffii amphidiploids of these species were produced and also of *N. rustica* x *N. tabacum*. On the same lines a fertile hybrid has been produced from the genomes *Triticum monococcum*, *T. dicoccum* and *T. vulgare* containing 42 chromosomes and it is suggested that the method should be of possible application also to other species. The production of unreduced gametes can be stimulated by abnormal, especially reduced, temperature. Many of the polygenom hybrids segregate, often producing new constant forms with balanced chromosome number in the F_3 . These segregating forms are a promising field for selection for economically valuable forms and the same may also be true of the various aneuploid forms which invariably occur together with the forms with balanced chromosome number.

438. SCHWARTZ, P. 633.71:575.127.2:576.356.5
(**Hypertetraploid tobacco resulting from interspecific hybridization.**)
C.R. Acad. Sci. U.R.S.S. 1934 : No. 3 : 183-87.

The authoress investigated some of Kostoff's *rustica-tabacum* composite hybrids cytologically and bred them further. She found plants with increased chromosome numbers ranging between 58 and 90. Among the progeny from a self-pollinated plant with a high chromosome number, a plant with 115-116 chromosomes was obtained. This plant is a hypertetraploid approaching the pentaploid condition. In *Nicotiana rustica* as well as *N. tabacum* $n = 24$.

439. MARESCALCHI, A. 633.71:575.148
Come si mantiene in purezza una razza di tabacco. (**How the purity of a strain of tobacco is maintained.**)
Nuova Antol. 1933 : 68 : Fasc. 1460.

The Bulgarian tobacco Perustitza, on account of its excellent qualities was widely cultivated in Italy. Recently however the quality began to degenerate and the methods used for the isolation of the pure types for the distribution of seed are described.

440. LAMMERTS, W. E. 633.71:576.356.52:576.354.46
On the nature of chromosome association in *Nicotiana tabacum* haploids.
Amer. Nat. 1934 : 68 : p. 467.

Evidence indicates that a haploid of coral *N. tabacum* shews a higher degree of association at pachytene and at the first metaphase than is found in normal haploids. Moreover the associations, except for the duplicated coral segment, are mostly non-homologous. It is concluded that, in haploids and hybrids with variable pairing, the observation of bivalents at diakinesis and at the first metaphase is not of itself proof of duplicate segments.

441. POVOLOCHKO 633.71:581.162.4:535.61-31
(**The use of ultra-violet rays in inter-species hybridization in *Nicotiana Tabacum*.**)
Bull. Appl. Bot. Leningrad 1934 : Ser. A (9) : 161-62.

The penetration of the pollen tube into the ovary brings about certain changes, physiological and otherwise, in the egg cell, without which it is incapable of fertilization. In interspecific *Nicotiana* hybrids this process is often disturbed, resulting in sterility. Ultra-violet rays apparently effect a change similar to that produced by the pollen tube and greatly increase the amount of setting in such sterile hybrids.

442. CALCAGNILE, S. 633.71:581.5:575.679.7
L'ecologia nei suoi rapporti con la genetica e con la combustibilità del tabacco.
(**Ecology in its relation to genetics and to the burning quality of tobacco.**)
Boll. Agric. 1933 : 4 : N. 1-2-3.

An investigation of the effect of climate and environment on the morphological structure of the tobacco plant and consequently on its burning quality shews that favourable light and heat conditions and sufficient humidity augment the burning quality, but that this is diminished by excessive photo-thermic action and by a deficiency of humidity, which cause a heavy deposition

of cellulose within the plant. Plants selected on the basis of resistance to drought and heat have therefore a poor burning quality and such knowledge must be taken into consideration when breeding. The selection of early maturing plants, which thus avoid the effect of the dry season and crosses to combine the desirable qualities offer the best means for obtaining the desired results.

443. 633.71-2.8-1.521.6
633.71 Ambalema
 NOLLA, J. A. B. and ROGUE, A.
A variety of tobacco resistant to ordinary tobacco mosaic.
 J. Dept. Agric. P.R. 1933 : 17 : 301-03.

A preliminary note on an apparently mosaic resistant variety of tobacco, Ambalema, grown from seed obtained from Colombia. In a population of some six hundred plants raised in 1929-30 in Puerto Rico only four individuals shewed symptoms of the disease. Resistant plants were selected and crosses made with a susceptible variety and inheritance studies are in progress. Up to the present inoculation experiments have shewn that most plants of Ambalema do not exhibit any very marked symptoms of disease.

444. 633.71-2.8-1.521.6:575.11
633.84-2.8-1.521.6:575.11
635.646-2.8-1.521.6:575.11
 HOLMES, F. O.
Inheritance of ability to localize tobacco-mosaic virus.
 Phytopathology 1934 : 24 : 984-1002.

This paper describes a Mendelian factor (dominant in certain cases) causing localization of tobacco mosaic virus in inoculated leaves of *Capsicum frutescens* L.

Plants bearing the localization factor are susceptible to infection with the virus but resistant to the spread of the virus in their tissues ; they respond by small spots of sharply defined necrosis at the site of inoculation, followed by early abscission of the inoculated leaf and subsequent healthy growth of the plants to maturity. Individuals carrying the recessive allelomorph shewed systemic spread of the virus, stunting of the plant, mottling and distortion of leaves and reduced yield of fruit.

The crosses which form the experimental basis of the foregoing results were made between varieties of *Capsicum*. Hybridizations of varieties of *Nicotiana* and of *Solanum melongena* respectively suggest that somewhat similar genetic factors determining necrotic response were also present in a number of species of these two genera ; in *S. melongena*, however, dominance appears to be incomplete.

445. 633.72:575.42
 WELLENSIEK, S. J.
 Principes voor het selecteeren van moederboomen bij thee. (**Principles for the selection of mother trees in tea.**)
 Bergcultures 1934 : 8 : 894-902.

Mother tree selection is followed by vegetative multiplication, testing, and the use of the tested clones as planting material. It has already been carried out for seedling plantings.

The most careful selection gives the best chance of obtaining good clones.

Details are given of the considerable variation in individual yields in a study of 1569 plants ; e.g. the 10 per cent poorest yielders gave 1 per cent of the total yield, while the 10 per cent best gave 20 per cent, and so on.

Selection of the best 0.5 per cent plants, which would give a minimum yield three times the general mean, is taken as the chief aim.

Selection can be based on any commercial type.

The best number of plants to serve as a basis for selection is discussed, and 4,000, i.e. about half a hectare, appears to be generally suitable, but more may be used with very high yielding material.

The number of plants actually to be recorded individually can be reduced through preliminary selection by the eye of the 4 or 5 per cent best yielders. Actual experiments established the sufficient accuracy of eye selection based on the rate of shooting shortly after pruning, the size of the plucking surface, and the density of the shoots on that surface.

Variation in yield from one picking to the next was studied in 1569 bushes over 48 pickings between prunings. Correlation coefficients are given between the yields of all the 48 and from 1 to 12 pickings. Five to 6 pickings ($r = 0.93$), preferably in the East Monsoon, are sufficient for individual yield records. For greater accuracy 10 pickings ($r = 0.95$) would be necessary as the correlation is less for 8 and 9 pickings.

After discussion, the selection of mother trees is based on several criteria :—

- (1) A minimum yield of three times the mean of all plants (unless the general mean is very high and conditions 3 and 4 are fulfilled).
- (2) At most 1 per cent of the total number of plants.
- (3) An absolute mean production of at least 50 g. wet leaf per picking.
- (4) A separate position in the frequency table for yield.
- (5) A regular yield from picking to picking. Practical details of labelling and numbering are dealt with.

Selection for quality is less advanced, and is best carried out on the trees selected for quantity of yield. If groups of these give favourable results for prepared leaf they can be carried on and later more detailed tests for quality made on the clones established from them. L. E. M.

446. GOCHOLASHVILI, M. M. 633.72-2.111-1.521.6
(Testing of the frost resistance in some varieties of the tea bush.)
Bull. Res. Inst. Tea Ind. U.S.S.R. 1933 : No. 2 : 27-48.

A rather full study of cold resistance in tea, the methods of estimation and the relative resistance of a number of varieties.

447. KRUG, C. A. 633.73:576.312.35
Beitrag zur Cytologie des Genus *Coffea*. (A contribution to the cytology of the genus *Coffea*.)
Züchter 1934 : 6 : 166-68.

As a result of cytological investigations on mitotic metaphases in the cells of root meristems and meiotic metaphases in the pollen mother cells the following varieties of *Coffea arabica* L. were found to have 44 somatic chromosomes: *Coffea arabica* var. *Nacional*, var. *Bourbon*, var. *laurina*, var. *Maragogipe* Fern. and var. *amarella*. In three other species *C. canephora*, *C. Excelsa* and *C. congensis* the somatic chromosome number was 22. These results agree with Homeyer's view that the basic number for *Coffea* is $n = 11$. They also explain the sterility found in the progeny of interspecific crosses between members of the diploid and tetraploid groups.

448. Relatorio e Anuário do Instituto de Cacau da Bahia. (Report and annual of the Instituto de Cacau da Bahia.)
Bahia 1934 : Pp. 256. 633.74.00.14(81)

In the experimental section reference is made to germination tests on the seeds : no effect on germination was observed from treatment by various chemicals ; green seeds germinated better than mature seeds and the position in which the seed was placed in the soil made a difference. Some of the trees observed have borne 400 to 600 pods per annum, giving 15-20 kg. of commercial cocoa. Others hardly give a dozen pods. Planting should therefore be made from such high yielding trees, vigour and disease resistance being also taken into consideration. Grafts have been taken from the most productive trees and the majority of the resulting plants have proved above the average ; some were no better and occasionally even below the average. The genetic constitution of the stocks used was unknown, which would account for this variation. Since 30 per cent of the fruits are cross-pollinated, even by grafting on to seedlings of the same plant the variation in the stocks is not altogether eliminated. Another important consideration is the proportion of beans to shell, since 20 pods of certain types have been observed to yield as much cacao as 59 of another type. Freedom from *Phytophthora Faberi* is a further essential in selecting planting material.

As regards quality, this is higher the closer the approximation to Criollo, since all plantations of any size are genetically impure to a greater or lesser degree. The hybrids of Criollo referred

to as *Theobroma pentagona* are mentioned as commanding high prices while hybrids of Criollo (*T. cacao*) with *T. leiocarpum* are also classed as "fine" and their cultivation will probably extend. Of the various types of *T. leiocarpum* grown, the "Comum" is genetically the most pure and so yields the most uniform commercial product; "Pará" and "Maranhao" are more variable. Illustrations are furnished of a number of local types and hybrids.

449. KAREL, M. 633.75:576.16:578.081
576.16:578.081
Metoda na rozlišování makových odrůd podle barvy klíčků, vyrostlých na světle. (A method for distinguishing poppy varieties by the colour of the seedlings germinated by shaded light.)
Věstn. Čsl. Akad. Zeměd. 1934 : 10 : 439-43.

By a test which is recommended *inter alia* for use in breeding work, it is possible by examination of the colour of the embryonic sheath and also of the hypocotyl and of the cotyledons, to distinguish the seeds of individual sorts of poppies.

AROMATIC PLANTS, SPICES, ETC. 633.81/4

450. CHARBONNEL, J. B. 633.822
633.822:575.12
Menthae Exsiccatae.
J. le Petit Havre 1930 : Fasc. VI and VII : Pp. 37.

Botanical descriptions of a large number of mints and their hybrids are given and problems of classification and the distinguishing marks of hybridity are considered.

OIL PLANTS 633.85

451. MOROZOV, V. K. 633.854.78:575.125
(Practical utilization of the phenomenon of heterosis in the sunflower.)
Semenovodstvo (Seed Growing) 1934 : 4 : 69-72.

In various sunflower crosses the hybrids in certain characters exceeded not only the two parents but also the variety used as standard (No. 169.) Eleven pairs of inbred families were sown in isolated plots in 1932-33, the flowering time of the two varieties chosen being as nearly as possible the same. The hybrid plants in the progeny could be easily distinguished from the selfed plants by their greater vigour of growth, height, diameter of inflorescence and size of leaves. The proportion of hybrid plants in the progeny varied from 15.6 to 77.8 per cent. On comparing the crossed with the selfed progeny the former invariably proved equal or superior to the standard in height and diameter of inflorescence while the selfed progeny was 10-30 per cent below the standard. The differences in yield of seed were still more pronounced some combinations exceeding the standard by up to 22 per cent and only four being below. The oil content of the kernels was increased by up to 13 per cent but no marked differences were observed in rust resistance. The crossed plants were less affected by drying winds and their seeds were markedly heavier. All these combined factors resulted in a very considerable increase in yield of oil and the method is of undoubted practical value.

452. CHEVALIER, A. 633.855.34
633.855.34:575.42
La patrie des divers *Elaeis*, les espèces et les variétés. Où en est la sélection ?
(The home of the various forms of *Elaeis*, the species and varieties.
How far has selection progressed ?)
Rev. Bot. Appl. Agric. Trop. 1934 : 14 : 187-96.

The genus *Elaeis* contains only two or three species, one *E. melanococca* peculiar to tropical America, the other *E. guineensis* still found wild in its primitive form, and *E. ubanghensis* A. Chev. in various regions of tropical Africa.

The form *E. madagascariensis* found wild in Madagascar may possibly be a distinct species. Selection of the oil producing varieties of *E. guineensis* is still in the initial stages and may possibly yield no better results than the empirical native methods.

RUBBER PLANTS 633.9

453. KRAJEVOJ, S. 633.913:576.356.5
On the tri-, tetra-, and hexaploid chromosome complements in somatic cells of *Scorzonera Tau-saghyz*.
 C.R. Acad. Sci. U.R.S.S. 1934 : No. 4 : 284-88.

The author made a cytological study of the root tips of germinating seeds, collected from various parts of Kazakhstan and found that normally $2n = 14$. In the meristem, cells with 14, 21, 28 and 42 chromosomes were observed. Triploid and tetraploid cells occurred in both the plerome and the periblem. The roots usually represent chromosomal chimaeras.

FRUIT TREES 634

454. 634:575:578.08
(Principles of the organization and methods of plant breeding. II. Fruits and small fruits.)
 Suppl. 64 Bull. Appl. Bot. Leningrad 1934 : Pp. 79.

The second volume deals with breeding methods applied to fruit trees on the same lines as the first volume (see Abst. 296 above) treated the cereals. Much more emphasis is laid on distant hybridization and the use of related wild species and forms and of back-crossing. In addition to the main pome, stone and citrus fruits consideration is given to various nuts, small bush fruits and to grape vines.

Fruit breeding is so important that seven fruit breeding centres have been established in various parts of the Soviet Union and the plan of work of these centres is briefly outlined.

455. ENAMENSKII, I. E. 634:575.127
(The Work of the Botanical Institute at Michurinsk.)
 Sovjetskaja Botanika (Soviet Botany) 1934 : No. 2 : p. 128.

Based on the remarkable achievements of I. V. Michurin in interspecific crossing in fruit trees, the work of the station is now being directed towards the scientific basis of these results, cytological and genetical, reference being made also to the allied sciences of physiology and biochemistry in the search for new and improved methods.

456. 634:581.162.31
 634.63:581.162
 RIABOV, I. N. et al
(Pollination and fruiting of fruit trees. Part 2.)
 Trudy gosudarstvennogo Nikitskogo Botaničeskogo Sada. (Bull. Nikita Bot. Gdn.) 1934 : 14(2) : Pp. 190.

A collective work on experiments of the Nikita Botanic Garden on the effect of self-pollination in various fruit trees. Most varieties of pears investigated set fruit on self-pollinating, though the fruit was often different in shape and the seeds were infertile. Very few varieties of apricots had inviable pollen and self-sterility was usually of a physiological nature. Many varieties also had defective stamens. The case of almonds was the same. Most peaches gave fruits with fertile seeds; cherries and plums contained both fertile and infertile groups. Apple varieties also fell into groups, some self-fertile, some self-sterile, while the majority were partially fertile. Both in pears and apples the pollen in self-sterile forms was often viable. Studies were made of the pollen viability of the varieties of the different fruits and those having non-viable pollen are enumerated.

A full study was made of the floral biology of the olive. Various abnormalities of the flower, consisting of different degrees of abortion of the ovary and their distribution on the inflorescence are described. The degree and kind of anomalies vary considerably from year to year. In most cases flowers with defective ovaries also have defective pollen. The presence of defective flowers is influenced by growth conditions but is also a varietal characteristic, different varieties reacting differently. All varieties tested bore fruit on self-pollination but in varying degrees; eight varieties are enumerated as from a practical point of view self-fertile and eleven as self-sterile, given suitable growth conditions, though the yield of fruit from all varieties was increased by artificial pollination. Parthenocarpy was not infrequent after self-pollination.

The pollen viability, even in the normal flowers, was very variable and seldom amounted even to as much as 70 per cent.

457. MIEDZYRZECKI, C. 634:581.162.5
 Stérilité du pollen chez les arbres fruitiers. (**Pollen sterility in fruit trees.**)

Cong. Int. Arbor. Fruit. Pomol. Casablanca 1934 : 49-56.

Forms of pollen sterility due to morphological, cytological and physiological causes are briefly reviewed.

458. SAX, K. 634.1:576.16
 The origin of the *Pomoideae*. 634.1:576.312.32

Proc. Amer. Soc. Hort. Sci. 1933 : 30 : 147-50.

Unable to find any evidence for multivalent association in the diploids of a number of genera in the *Pomoideae*, the author questions the assumption of Darlington and Moffett that the chromosome numbers of the group have arisen by a simple reduplication of the basic number 7.

From his own results and the results of other workers on the absence of multivalent association, and the behaviour of triploids and the self-sterility of species of *Malus* and *Pyrus*, the author concludes "that the *Pomoideae* are of allopolyploid origin and were produced by hybridization between different primitive forms of the *Rosaceae*, followed by chromosome doubling."

459. MIEDZYRZECKI, C. 634.1:576.312
 634.1:581.162.51

Etudes cytologiques et stérilité du pollen chez le pommier et le poirier. (**Cytological studies and the sterility of the pollen in the apple and pear.**)

C.R. Soc. Biol. Paris 1933 : 114 : 1267-71.

The reduction division was studied in certain diploid and triploid varieties of apple and pear. A number of irregularities were noticed in the diploid apples which are attributed to the high temperature of the season.

In the triploids, both pear and apple, the irregularities were much more marked. These aberrations affect the fertility of the pollen of the triploids, which produce only 4-30 per cent of good pollen. The percentage of good pollen was found in the diploids to be 45-95 per cent and genetical factors are held to account for their sterility.

460. PASSECKER, F. 634.1:581.162.3(43)
 634.2:581.162.3(43)

Die Befruchtungsverhältnisse der Kern- und Steinobstsorten. (**The pollination relationships of pome and stone fruits.**)

Obst- u. Gemüseb. 1933 : 79 : 98-100 118-19.

The main facts of pollination are briefly discussed and a list is given of a number of apple and pear varieties with the nature of their pollen, good, medium or poor and whether they are early, medium or late flowering.

461. BOVEY, P. 634.1:581.162.3:581.162.5
 634.2:581.162.3:581.162.5
 Floraison et fructification des arbres fruitiers. (**Flowering and fruiting in fruit trees.**)

Rev. Hort. Suisse 1933 : 6 : 245-54.

A description, intended for the practical horticulturalist, of the various processes of reproduction in fruit trees. The usual problems of pollination and the phenomena of auto-sterility, pollen sterility and inter-sterility are discussed.

The cytological basis and the practical importance of pollen sterility is explained with reference to apples, cherries and plums.

462. 634.1:581.162.3
634.2:581.162.3
BAIBUZ, V. P. and SERGEEVA, A.
(The importance of proper cross-pollination as affecting the productivity of fruit crops.)
Publ. Crimean Zonal Exp. Sta. for Tree and Small Fruit Culture 1933 :
Pp. 12.

A popular appeal for a rational lay-out of orchards on the collective farms, based on (1) the age at which the particular fruit trees first yield fruit and (2) the necessity for cross-pollination in most tree fruits. Varieties of apples, pears, plums and cherries which should under Crimean conditions be planted together are enumerated.

463. 634.11:575.182
HEYDEMANN, F.
Eine seltene "Metaxenia" beim Apfel. (A peculiar instance of metaxenia in the apple).
Obst- u. Gemüseb. 1933 : 79 : 100-01.

Various records of metaxenia are recalled and a request is made for any further information that may help to elucidate the cause of this condition. Of two cases observed by the author in apples, the second was a yellow skinned specimen with numerous faint and short red streaks and in addition one sector of uniform red colour from calyx to stalk—a result attributable probably to the physiological influence of the seed in the locule underlying the sector.

Possible explanations put forward are either (1) cross-fertilization of only one stigma and limited to one locule or (2) general cross-fertilization but with the anomalous development confined to one section only except for the slight streaking on the rest of the fruit.

This is believed to be the first record of "sectorial-metaxenia."

464. 634.11:575.182
635.62:575.182
HIBBARD, A. D.
Metaxenia in the apple and squash.
Proc. Amer. Soc. Hort. Sci. 1933 : 30 : 140-42.

The results of experiments to demonstrate the occurrence of metaxenia in the Ingram variety of apple and in several varieties of pumpkins and bush varieties of *Cucurbita pepo* were negative.

465. 634.11:575.182
KUPKE, W.
Weitere Fälle von "Metaxenia" beim Apfel. (Further cases of "metaxenia" in the apple).
Obst- u. Gemüseb. 1934 : 80 : 68-69.

Further instances of this condition in apples are discussed. Reports of similar anomalies from two correspondents include a record of a peculiar apple exhibiting what might be either metaxenia or a condition similar to that found in graft hybrids. Further data on this case are to be published later. (See also "Plant Breeding Abstracts," Vol. III, Abst. 486 and Vol. V, Abst. 463.

466. 634.11:575.252
FRENCH, A. P.
An unusual leaf variation of the apple.
Proc. Amer. Soc. Hort. Sci. 1933 : 30 : 143-46.

The occurrence on a one year seedling shoot of Red Astrachan of leaves which were very narrow and deeply serrated is described and the subsequent behaviour of the buds is followed. The data suggest that the variation is due to the mutation of part of the tissue of the stem.

A similar leaf variation on a one-year Mackintosh seedling shoot is also noted.

467. 634.11:575.252
TUCKER, L. R.
A sweet Jonathan bud "sport."
Proc. Amer. Soc. Hort. Sci. 1933 : 30 : 154-55.

A tree, probably a bud sport of the Jonathan apple, which it resembles in every particular, except much increased sweetness of the fruit, is described.

468. LATIMER, L. P. 634.11:581.162.3
Pollination and fruit setting in the apple.

Sta. Bull. N.H. Agric. Exp. Sta. 1933 : No. 274 : Pp. 38.

The pollination problem is discussed and a brief account given of flower bud formation and fruit development and of fertilization in the apple.

The conditions for pollination in New Hampshire are described and the results of pollination experiments with McIntosh, Cortland, Delicious and Gravenstein are given.

Suggestions are made for orchard planting and management,

469. WENTWORTH, S. W. 634.11:581.162.3
Apple pollination studies in Maryland.

Proc. Amer. Soc. Hort. Sci. 1933 : 30 : 17-21.

York Imperial was found to be commercially self-sterile as was also Golden Delicious under Maryland conditions.

The results of pollinations with a number of other varieties are given and also the results of using York Imperial and Golden Delicious as pollinators for other varieties.

470. BOYD, R. L. and LATIMER, L. P. 634.11:581.162.3.056
The relation of weather to pollination of the McIntosh apple.

Proc. Amer. Soc. Hort. Sci. 1933 : 30 : 12-16.

It was the authors' experience that lack of sunshine and high humidity were favourable to fruit-setting in the apple when hand pollinated. The reverse conditions on the other hand are probably detrimental as they may cause a drying of the stigmas.

A good set of fruit was even obtained when pollinations were made during heavy rain.

471. VARGA, F. 634.11:581.162.51:575.113.7
**Adatok néhány almafajta pollen-meddőségének genetikai magyarázatához.
 (On the genetic explanation of the pollen sterility of some varieties of apples.)**

Magy. Tud. Akad. Math. Természett. Ertesítője 1931 : 48 : 359-416.

In each of the three varieties of apples Wintergoldparmäns, Roter Stettiner and Batullen (a Hungarian variety) normal and abnormal pollen was found. From a statistical study of variation in the various morphological groups it is concluded that their existence is due to the presence of recessive sterility factors and that all three varieties in question are heterozygous for at least four factors.

In the variety Batullen, as compared with the other two, the balance of dominants and recessives seem to be more favourable and this variety is regarded as the best.

472. TUFTS, W. P. and HANSEN, C. J. 634.13:575.182
Xenia and metaxenia in the Bartlett pear.

Proc. Amer. Soc. Hort. Sci. 1933 : 30 : 134-39.

Further investigations on the possible effect of number of seeds on the shape of the fruit shewed, though the data are possibly insufficient, that there is a negative correlation between number of seeds and the ratio length to diameter of the fruit but that there is a positive correlation between the number of seeds and the diameter, the length being practically independent of the number of seeds. If therefore metaxenia affecting shape does occur in the crosses made with this variety, it is masked by the effect of number of seeds. No other expressions of metaxenia were detected.

Slight differences in the length and breadth of the dried seeds from the various crosses are possibly due to xenia but this is considered doubtful.

473. VARGA, F. 634.2:581.162.51:575.113.7
Adatok a *Prunus* genusz pollenmeddőségének genetikai magyarázatához.
(On the genetic explanation of pollen sterility in the genus *Prunus*.)
Magy. Tud. Akad. Math. Természett. Ertesítője 1932 : 49 : 103-25.

The pollen of the plums, greengages, cherries and apricots investigated in seven varieties could be classed morphologically into two groups, normal and abnormal. The variation curve for the pollen of the plums and greengages was either unimodal (Ungarische Hauszwetsche and Althann's Reineclaude) or bimodal (Beszterceer Muskateller and Grüne Reineclaude). For the remaining varieties, i.e. the cherries, Maiknorpel Kirsche and Germersdorfer and the apricot Ungarische Beste bimodal or polymodal curves were obtained.

It seems very probable that the gametic sterility observed is due to recessive factors, numbering five in the plums and greengages and four in the cherries and apricots.

The relative value of six of the different varieties as pollinators is indicated.

474. RUDLOFF, C. F. 634.22:575
634.22(49.6)
Prunus cerasifera-Sämlinge aus Anatolien und ihr Wert für die Pflaumen-
züchtung. (*P. cerasifera* seedlings from Anatolia and their value in plum
breeding.)
Obst- u. Gemüseb. 1934 : 80 : 21-22.

The potential value of these seedlings as breeding material is made clearly evident from the remarkably good performance of a collection of trees under conditions of severe drought and cold and intentional cultural neglect.

The seedlings were raised from seeds brought back from Anatolia by Professor Baur in 1926 and sown in 1927. Vigorous growth characterized the young seedlings and this year the flowering was profuse and the yield of fruit abundant.

The wood appears to be resistant to the sharpest frosts and the blossoms too fairly certain to withstand unfavourable weather conditions. Very modest cultural requirements, healthiness and early bearing complete the good characteristics which are regarded as fairly certain to be heritable. Hence in spite of certain less desirable points such as inferior flavour, etc. and a low horticulture value, on the whole the seedlings are regarded as specially useful breeding material.

In 1933 crosses were begun and are being continued.

475. SHAMEL, A. D. and POMEROY, C. S. 634.22:575.252"793"
A bud variant of the Santa Rosa plum. A late-maturing form possibly
of commercial importance.
J. Hered. 1934 : 25 : 379-82.

The origin and general characteristics of this new strain are recorded. It is large, oval and deep purplish-crimson in colour, with a delicate blue bloom ; the flesh is firm and light amber coloured with a good flavour.

A similar variation in the Santa Rosa plum has been recorded from another district.

476. TOSTI-CROCE, E. 634.22:581.162.5
634.22:575.127.2:634.21
Sull' autosterilità del susino " Burbank." (On the autosterility of the Bur-
bank plum.)
Ital. Agric. 1934 : 71 : 575-80.

The results are given of experiments on the pollination of the Burbank plum with the apricot and *Prunus spinosa*. A fair set of fruit was obtained in the former case and an excellent set in the latter. A case of natural pollination of the Burbank with *P. spinosa* is also recorded.

The possible origin of the Burbank plum is discussed.

477. BECKER, C. L. 634.23:576.312.35
634.23:581.162.5
Chromosome number and self-fertility in *Prunus virginiana* and *P. pennsylvanica*.
Proc. Amer. Soc. Hort. Sci. 1933 : 30 : 122-23.
As a preliminary to crossing experiments for the production of hardy types, between the cultivated sweet and sour cherries with the hardy native species *P. virginiana* L. and *P. pennsylvanica* L., the chromosome numbers of the latter were determined. Thirty-two 2n chromosomes were found in *P. virginiana* and 16 diploid in *P. pennsylvanica* and it is therefore suggested that from the work of Darlington and of Kobel the former may cross most readily with the sour cherries and the latter with the sweet cherries.
With regard to fertility *P. virginiana* though self-fertile shewed a much higher fertility when cross-pollinated. *P. pennsylvanica* was also self-fertile.
478. COE, F. M. 634.23:581.162.3
Cherry pollination studies in Utah.
Bull. Utah Agric. Exp. Sta. 1934 : No. 245 : Pp. 53.
The results are given of investigations made to determine the pollination conditions of the Utah orchards ; to determine what varieties and strains were satisfactory pollinators for Bing, Lambert and Napoleon, the varieties most grown in Utah and found to be inter-sterile ; to find if possible better pollinators than Black Tartarian and Black Republican and to test the value of other varieties and strains as pollinators.
479. BLAKE, M. A. 634.25:575.11
Additional facts in regard to the J. H. Hale peach as a parent in breeding work.
Proc. Amer. Soc. Hort. Sci. 1933 : 30 : 124-28.
This paper represents a continuation of the work previously recorded (see "Plant Breeding Abstracts," Vol. IV, Abst. 236) and adds further details to the knowledge of the behaviour of the J. H. Hale peach as a parent in crosses with other varieties.
480. DAVIDSON, O. W. 634.25:581.142:578.08:575
The germination of "non-viable" peach seeds.
Proc. Amer. Soc. Hort. Sci. 1933 : 30 : 129-32.
It has been found that the seeds of the early ripening peaches are either non-viable or are only viable to a very low degree. A method is described whereby germinations and normal later development can be obtained so making crosses between early varieties of practical value to the plant breeder.
481. UPHOF, J. C. TH. 634.3:581.46
634.3:581.162.3
Wissenschaftliche Beobachtungen und Versuche an Agrumen. VI. Einiges über die Blütenverhältnisse (I. Teil). **Scientific observations and experiments on citrus. VI. Observations on the flowers and flowering. (Part I).**
Gartenbauwiss. 1934 : 8 : 394-410.
Observations in Florida from 1921-33 form the basis of this paper which deals first with the comparative general morphology of the flowers and then with their biology in a number of citrus forms and hybrids.
The flowers of the various species differ on the whole but, within the species, only slightly, whilst in most hybrids the characters are intermediate.
The morphological relationships governing self-pollination, which is of frequent occurrence, are mentioned. Self-pollination in the bud may also be observed.

Reports vary as to the set obtainable from self-pollination; in the author's experiments it was relatively low and cross-fertilization gave better results. The occurrence of apogamy in various varieties and species and of artificial autogamy due to the visits of bees is recorded. The questions of defective pollen and germination capacity are discussed and the time required for germination is exemplified with reference to a number of varieties. The high fertilizing capacity of the fertile pollen of citrus species is shewn by the numerous hybrids cited from the list given by Wells.

482. 634.323 Ruby
634.323:575.252
FRIEND, W. H.
The origin of a superior red-fleshed grapefruit. Bud mutation of the Thompson variety of possible horticultural value.
J. Hered. 1934 : 25 : p. 358.

This bud mutation, "Ruby," which continues in the "second generation" buddings to produce fruit with a pink blush outside and "deep spectrum red" flesh colour was isolated from the Thompson variety. Since the latter is a pink fleshed sport of the Marsh (which is seedless) it is likely that the new strain represents a further somatic mutation at the same locus as that which produced the Marsh variety. If this be so, the effect is cumulative and the new sport would be expected to be homozygous for the factor concerned.

483. 634.451:575.183
NOGUCHI, Y.
Metaxenia in the Japanese persimmon. Shape and sweetness.
Jap. J. Bot. 1934 : 7 : 61-71.

In the Japanese persimmon, apart from instances of parthenocarp, the pistillate flowers are usually fertilized by pollen from other varieties. The varieties, which differ in size, weight and time of ripening, may be classed according to the taste of the ripening fruit as sweet or astringent. Various direct and reciprocal crosses were made between six varieties in all, three being of the sweet and three of the astringent type.

Though no marked difference in the length and diameter of cross-pollinated and selfed fruits were found, definite changes in the shape of the fruits due to the different kinds of pollen were observed. Similar indications of metaxenia were noted in the degree of sweetness of the fruits produced by pollination of a sweet variety by an astringent one, the change in the taste being more marked in the flesh near the seeds.

Possible explanations of the phenomenon of metaxenia are tentatively considered.

484. 634.51:575.127.5:634.54
CHAUDUN, V.
L'hybridation entre noyer et noisetier est-elle possible? (Is crossing between the walnut and the hazelnut possible?)
Rev. Hort. Paris. 1933 : 105 : 404-05.

Daniel's theory of the delayed fertilization of the walnut by pollen from flowers of the hazelnut as an explanation of a supposed hybrid fruit found on a walnut tree is considered. From an examination of a similar anomaly recently reported it is concluded that hybridization between these two nut trees and also xenia between intergeneric crosses are impossible.

485. 634.58(46.9)
MELLO GERALDES, C. DE
Contribution à l'étude des caractéristiques des arachides de la Guinée Portugaise. (Contribution to the study of the characteristics of the groundnuts of Portuguese Guinea).
An. Inst. Sup. Agron. Lisboa 1934 : 6 : 36-44.

An examination of the strains produced by the Experimental Station at Bór has shewn them to be higher in weight of pod and of seed and in oil content. There is apparently no correlation between the percentage of seed per pod and the oil content of the seeds or between the absolute weight of the pods or the seeds and oil content of the seed and it is desirable in selecting groundnuts therefore to make measurements of the oil content as well as of these other properties.

486. JULIANO, J. B. 634.65:581.162.5:581.162.3
Studies on the morphology of the Meliaceae: II. Sterility in santol,
Sandoricum koetjape (Burm. f.) Merrill.
 Philipp. Agric. 1934: 23: 253-66.

Since 1930 the sterile santol tree described has produced astonishingly large numbers of flowers which are shed on reaching maturity so that no fruits are ever formed. Moreover, the petals, in contrast to those of the normal santol tree, which are chasmogamic, remain overlapping and almost entirely closed so that cross-pollination is difficult if not impossible. Even self-pollination too is rendered difficult by the fact that the anthers fail to dehisce at the time when the flowers are being shed and even were found closed a day or two later and the pollen does not germinate under such conditions.

Morphologically the petals of flowers appear normal and the marked cleistogamic tendency is probably of physiological rather than morphological origin.

The actual development of the ♀ and ♂ gametophytes is normal. Degeneration of the microspores was noted both before and after the flowers were shed.

487. COOK, O. F. 634.651:581.45:576.1
 634.651:581.45:575.2

Double-deck papaya leaves and example of leaf evolution.

J. Hered. 1934: 25: 225-35.

This variation observed in 1932 among an exceptional planting of papayas in California consisted in a vertical addition to the leaf, supported by a secondary petiole growing out of the callus of the primary leaf blade. For leaves exhibiting the anomaly the term "superate" has been coined. In the author's opinion this "apical replication" may be regarded as a method of derivation of compound leaves from simple leaves and the new variation thus illustrated a constructive possibility in leaf evolution that has not been recognized in the past, but may be worthy of future study.

The various forms of secondary leaf blades are recorded and a description of the several possible modes of origin of compound leaves leads up to a discussion of variation among metamers and its evolutionary and genetic aspects.

488. EVREINOFF, V. A. 634.7
Actinidia arguta Planch. Nouvel arbuste fruitier. (*A. arguta* Planch. A
 new fruit-bearing shrub).
 Rev. Hort. Paris 1934: 106: 69-70.

This new fruit is a climbing shrub representing one of the 23 species of *Actinidia*. The berry, which is described, has greenish, melting juicy flesh with a very sweet winey taste and a delicate aroma.

Though the shrub is hardy and will stand temperatures down to -30°, certain difficulties arise in its cultivation owing to its poor keeping qualities, the difficulties of gathering the crop owing to the very long branches, earliness in flowering and vegetative growth and consequent damage by spring frosts.

The method of cultivation is shortly described.

489. SLATE, G. L. 634.711:575.12
The best parents in purple raspberry breeding.

Proc. Amer. Soc. Hort. Sci. 1933: 30: 108-12.

This paper represents a summary of the raspberry breeding records of the Experiment Station, Geneva, New York, which date from 1893, though most of the crosses reported have been made since 1920.

Of the various combinations of varieties used in the crosses, those which had red varieties as the pollen parent were in general successful as were also purple selfed, purple x purple and (purple x red) selfed, but if black varieties were used as the pollen parent the result was usually a failure.

A table containing a list of nearly 70 different crosses gives the number and percentage of the promising selections derived therefrom. The value of some of the varieties as parents is briefly discussed.

490. SCHWARTZE, C. D. 634.711.3:575.12
The genetic constitution of certain red raspberry varieties in relation to their breeding behavior.
 Proc. Amer. Soc. Hort. Sci. 1933: 30: 113-16.

A large number of seedlings from crosses and selfs among six varieties were examined to test the capacity of the parents to transmit certain desirable characters to their progeny. For fruit size Lloyd George was the best parent as the data shew this variety to be almost or completely homozygous for large fruit and the same holds for long shape of fruit. For the inheritance of flavour Cuthbert proved to be the best parent though Lloyd George transmits high acidity to its progeny, while for colour of the fruit the best were the homozygous varieties Latham, King, Antwerp and Marlboro. Lloyd George was found to be a homozygous hermaphrodite, a valuable asset. The value of such information for plant breeders is indicated.

491. MORRIS, H. F. 634.715:575.12
 634.717:575.12
A study of blackberry and dewberry varieties as breeding material.
 Proc. Amer. Soc. Hort. Sci. 1933: 30: 117-21.

The characters of a number of varieties of blackberries and dewberries are briefly discussed both from the point of view of their commercial value, especially for canning, under Texas conditions and also their possibilities as parents for breeding purposes.

492. COLBY, A. S. 634.725:581.47:575.11-181
Size inheritance in gooseberry fruits.
 Proc. Amer. Soc. Hort. Sci. 1933: 30: 105-07.

The size of fruit of the progeny of a number of varieties selfed and crossed was grouped in four classes. Large fruits were only obtained in Carrie x Poorman crosses and in the progeny from the selfed Glendale variety. The results indicate that multiple factors are involved and that of all the varieties used Poorman carries the greatest proportion of factors for large fruit size. Many of the large fruited seedlings are also promising in other respects.

493. DARROW, G. M. 634.75:575
Seven new strawberries introduced by U.S.
 Amer. Fruit Grower 1934: 54: No. 1: 11, 24. No. 2: 9, 23.

At the Plant Field Station near Glenn Dale, Maryland, 13 years ago a strawberry breeding experiment was begun with the object of producing varieties superior in dessert quality to existing commercial sorts and also capable of retaining their colour and flavour when canned or frozen. As a result seven varieties, the Blakemore, Bellmar, Southland, Redheart, Dorsett, Fairfax and Narcissa have been introduced. Their relative value as compared with each other and with other varieties grown in the United States and their suitability for various regions in the States are discussed. Other selections made since 1925 are still being tested with older sorts for disease resistance, vigour, hardiness and productivity of the plant, and size, shape, colour, flavour, dessert quality, canning quality, etc., of the fruit. None are yet ready for introduction.

494. CHODAT, F. 634.75:577.8:575.11
 Génétique des fraisières. V. Héritéité du sexe. (The genetics of strawberries. V. The heredity of sex.)
 C.R. Soc. Phys. Hist. Nat. Genève. 1933: 50: 158-62.

The variety President Dufour was crossed with Madame Moutôt. The latter, the male parent, has stamino-pistillate flowers which are functional hermaphrodites and the former had only pistillate flowers. The numbers of the female plants in F_1 suggested a 1:1 ratio and it is therefore assumed that the Dufour variety can be represented by the formula $AAGZZa_0\gamma$ where A is the gene determining maleness, B [*sic*. G ?] the gene determining femaleness and Z the gene

which determines the place and order in which the sexes appear on the individual plant; a is the realizator whose presence inhibits the functioning of femaleness and γ the inhibitor of the manifestation of maleness; o in the formula indicates that the capacity of the gene in question has fallen to zero. The F_2 results from selfing F_1 are held to confirm this hypothesis. The hybrid ($M \times D6$) ♀ (obtained from the John Innes Horticultural Institute) was crossed with *F. virginiana* ♂ in the hope of producing a variety with firm flesh. The genetic formula for the parents in this cross is stated to be $AAGGZZa_0a_0$ and $AAGGZZaa$ respectively. The reciprocal cross was unsuccessful. The F_1 plants had a normal androecium or a semi-reduced gynoecium and have therefore the formula $AAGGZZaa_0$.

495. CHEVALIER, A. 634.771:576.16
Observations sur quelques bananiers sauvages et cultivés. (**Observations on some wild and cultivated bananas.**)

Rev. Bot. Appl. Agric. Trop. 1934 : 14 : 506-21.

The systematic classification and the habitats of the various forms are described. The main groups belonging to the edible types are represented by *Musa paradisiaca-sapientum*, *M. nana-Cavendishii* and *Musa Fehi* Vieillard which is endemic in Oceania and is still found wild in the mountains of New Caledonia and Tahiti.

Among the wild bananas of Indo-China, *M. seminifera* Lour. is singled out as one of the probable ancestors of the fruit-producing banana. Other forms of this region have been regarded from time to time as a possible source of fibre for textile or paper manufacture. Other varieties from which textile products can be obtained are found in the Far East and in the Philippines, Celebes and Amboina and the Liu-Kiu archipelago.

The importance of a systematic and cytological analysis of the primitive wild forms is pointed out.

496. MAGISTAD, O. C. and FARDEN, C. A. 634.774-1.421
Experimental error in field experiments with pineapples.
J. Amer. Soc. Agron. 1934 : 26 : 631-44.

The results of various blank tests with pineapples in the island of Oahu are given to indicate that the variation in the data, mainly due to soil heterogeneity, does tend to follow the normal

law, which makes it permissible through use of the formula $\sigma_m = -\frac{\sigma_x}{\sqrt{n}}$ (where σ_x is the standard

deviation of a single observation and σ_m the standard deviation of a mean n observations) to make calculations when we know σ_x , as to the number of replications (i.e. n) required to yield significantly different results. By combining contiguous plots in different ways, the authors are able to discover how this σ_x varies with plots of different size and shape.

An investigation of individual fruit weight variation with a plot shews that a comparatively small sample gives a good estimate of the true mean.

Based on these observations and on records of previous experiments, which shew that the fields are of the same degree of uniformity throughout the Territory of Hawaii, recommendations are made concerning the best size and shape of plots, the number of replications and the layout of future pineapple experiments.

497. NEORAL, K. 634.83.094:575(43.72) G. B. L.
Výsledky pokusného pěstování amerických plodných hybridů na Moravě.
(**Results of experiments on the cultivation of direct producers in Moravia.**)

Rec. Inst. Rech. Agron. Rép. Tchécosl. 1933 : 104 : Pp. 77.

A report of 10 years work on direct producers grown in Moravia. The plants and their products were examined from the point of view of the grower and of the wine industry, and details are given of their reaction to cold and diseases, of their time of ripening, yield and the quality of their wine, etc.

Further breeding is needed for the production of a variety in which a good yield of grapes producing wine of a satisfactory quality is combined with adequate resistance to disease and other injuries.

498. DECKER, K. 634.835:575
Welche Zuchtziele fordert der deutsche Weinbau? (**What are the aims in breeding required for German viticulture?**)
Züchter 1934 : 6: 162-65.

Improvements are desired in the relations between stock and scion, disease resistance, resistance to effect of climate and in quality of dessert grapes and those for the making of red wine.

499. PIROVANO, A. 634.835:575(45)
Elaborazione genetica di nuove varietà e loro comportamento agrario.
(**Genetical elaboration of new varieties and their cultural behaviour.**)
Ital. Agric. 1934 : 71 : 819-26.

The need of the grower for a high yielding, easily cultivated variety of good quality is briefly discussed from the point of view of the plant breeder. Certain recommended varieties are described.

500. ANGELO, E. and BECKER, C. 634.843.2:576.312.35
Chromosome number of the Beta grape.
Proc. Amer. Soc. Hort. Sci. 1933 : 30 : p. 104.

The somatic chromosome number of this variety was found to be 38 corresponding to that found by other workers for *Vitis vulpina*.

501. MOOG, H. 634.843.2.09
Beiträge zur Ampelographie. (V. Mitteilung.) (**Contributions on ampelography. V.**)
Gartenbauwiss. 1934 : 8 : 365-84.

As a preliminary to breeding work an attempt was made to determine distinctive characteristics for the numerous varieties of *Vitis riparia* (Michx.) which in some cases closely resemble the American vines and their hybrids at the Geisenheim vine breeding station. Typical characters could be found only for a few varieties.

502. PIROVANO, A. 634.872:575.12:581.48
634.873:575.12
Sugli ibridi apireni di vite. (**On the seedless hybrids of vines.**)
Relazione presentata al III Congresso Internazionale della vite e del vino tenuto in Roma il 23-31 ottobre 1932-XI, 1934 : Pp. 6.

The difficulties which prevent the successful cultivation of currants and sultanas in Italy are briefly mentioned.

To improve the situation the author has made a number of crosses between ordinary grapes and seedless sultanas, in some cases treating the pollen and ovaries electro-magnetically. Several promising seedless types which appeared among the progenies are described and are being further investigated.

The main obstacle to the extensive cultivation, that of the lack of affinity between the sultana and stocks of other varieties, remains to be overcome.

FORESTRY 634.9

503. FANKHAUSER, F. 634.97:575
634.97:575.061.1
Über die Vererbung der Standortsansprüche und der Wuchsformen unserer Waldbäume. (**On the inheritance of regional requirements and of the growth forms of our forest trees.**)
Schweiz. Z. Forstw. 1930 : 81 : 241-53.

The existence of numerous local varieties among Swiss forest trees and the different response of highland trees to lowland environment and vice versa is discussed. The effects not only of altitude but of local climatic conditions too are also exemplified by considering the dependence of the success of plantings of various conifers in new localities upon the original habitat of the races from which the seed has been obtained.

In addition to altitude and climate a further factor in the formation of racial characteristics is the soil ; and from these three factors the whole complex of conditions which leads by natural selection and adaptation in the course of a long period of time to the formation of local races of trees arises. In the author's opinion, in estimating the suitability of a race for a particular locality, twenty or thirty years are quite insufficient to allow the defects due to seed of unsuitable origin to appear.

The author maintains that characteristics of growth form, such as straight or crooked stem, narrow or spreading crown, etc., are also hereditarily conditioned and examples are cited shewing the combined effects of descent, locality and nurture on growth forms in beech, pine, fir, spruce, oak and other trees.

In view of the role of inheritance in race formation, the importance in re-afforestation of weeding out unsuitable types and of improving races by selection is obvious, and where artificial methods are necessary the seed used should be exclusively from the indigenous local race or, where the race has disappeared, from trees in the neighbourhood, growing under the same local conditions as the original race.

Some practical precautions for obtaining suitable seed are given.

504.

PASQUIER, R. DU

Renseignements sur l'arbre à laque du Tonkin. (**Information on the lac-bearing tree of Tonkin**).

Bull. Econ. Indochine 1934 : 37 : 494-501.

634.97:667.211.13]:575.42

634.97:667.211.13]:575.12

Up to the present, selection by the grower has been directed first to collecting seed only from the highest yielding trees, with reddish rugged bark and dark leaves and secondly to reserving for pruning only young trees with reddish shoots and comparatively dark coloured leaves. These empirical methods have proved ineffective and the Phu-hô Station has begun work on the problem of the improvement of " lac trees."

The supposed correlations referred to above between certain morphological characters and productivity have been examined, and the bark characteristics, though in fact found with high yield, are not regarded as specific for distinct races but are attributed to growth conditions. Leaf shapes vary little but the extreme forms require further investigation. Leaf colour differences appear to be conditioned by the nature of the soil. The possible genetic value of the reddish colour of the young shoots is being tested.

As regards fertilization it has been proved that the lac tree is always dioecious and there are not, as has been supposed, any true hermaphrodite flowers.

Control experiments have revealed no marked difference between the production from ♂ and ♀ trees.

As methods of improvement, artificial pollination, for which the best types are selected, is now being tried, and grafting has given good results.

505.

BORNEBUSCH, C. H.

Den danske Bøgs Foraeldling. (**Improvement of the Danish beech tree**.)

Dansk Skovforen. Tidsskr. 1933 : No. 6 : 292-95.

HELMS, J.

" Moderbøgen " i Silkeborg Nordskov og dens Afkom. (**" Mother beeches " in the north wood of Silkeborg and its progeny**.)

Dansk Skovforen. Tidsskr. 1933 : No. 9 : 403-07.

BORNEBUSCH, C. H.

Om Moderbøge. (**On mother beeches**.)

Dansk Skovforen. Tidsskr. 1933 : No. 10 : p. 526.

The first of the above three papers is an invitation in support of Professor Oppermann's campaign emphasizing the importance of heredity and desirable races and types in forestry.

The defects in Danish beech trees should be remedied by the careful selection of mother trees combined with progeny tests.

Sketches of undesirable and desirable trees to breed from are shewn, the best two having an erect stem with the lateral branches set at a wide angle to the main stem and not too numerous.

The importance of progeny tests followed by selection is obvious where breeding material has to be obtained from trees such as the beech and oak which do not bear fruits in any considerable quantity until they are between 50 and 100 years old. In a good mast year a well developed beech may produce from 25-50 thousand beech nuts which will provide seedlings sufficient for one half to one hectare ; so that a relatively small number of selected mother trees would be required for the re-afforestation of Danish woods.

In conclusion the State Forestry Research Department appeals to the various forest districts to notify the writer (who is Director of the Department) of any selected trees throughout the country for inspection ; and subsequently small plot tests for comparison of the seedlings from certain trees finally selected will be carried out. As an alternative if trials are desired with more trees than the State Forestry Research Department can cope with, the actual tests can be made by the district forestry workers themselves, and the results will be evaluated by the Forestry Research Department so that data for future work may be collected as soon as possible.

The method above described would not be costly and should form the basis of all artificial cultivation of beech and oak trees.

In the second and third papers the value of two trees suggested for inclusion in the progeny tests is discussed.

506.

AUFDERHEIDE, H.

634.972.5:576.312.35

634.972.1:576.312.35

Chromosome numbers in *Fagus grandifolia* and *Quercus virginiana*.

Butler Univ. Bot. Stud. 1931 : 2 : Paper No. 5 : 45-52.

Q. virginiana and *F. grandifolia* were both found to have 12 as their diploid number of chromosomes.

507.

LILJEFORS, A.

634.973:581.163

634.975:576.312.35

Über normale und apospore Embryosackentwicklung in der Gattung *Sorbus*, nebst einigen Bemerkungen über die Chromosomenzahlen. (On normal and apoporous embryosac development in the genus *Sorbus*, with observations on the chromosome numbers).

Svensk Bot. Tidskr. 1934 : 28 : 290-99.

A preliminary communication dealing with the embryological and cytological aspects of apomictic reproduction in *Sorbus*.

A list is given of the haploid chromosome numbers already known and verified by the author's observations on European species. From the triploid hybrid *S. aucuparia* x *S. suecica* indirect evidence is adduced which tends to shew that *S. Meinichii* cannot be the hybrid *S. aucuparia* x *S. fennica*, as has sometimes been maintained. Triploid forms naturally shew meiotic disturbances and no entirely normal reduction division was observed in the tetraploid forms either. On comparing the chromosome numbers in the present material with Hedelund's arrangement of *Sorbus* species according to age, the diploids were found, as expected, to belong to the oldest species with the exception of *S. chamaemespilus*, of which the author found only a tetraploid form, though this species too should belong to the oldest group. The existence of a diploid form is, however, thought probable. The polyploid forms are regarded as derived from diploids. It seemed likely that when polyploidy arose these new species also acquired the capacity of apomictic seed formation. Whether they were also capable of facultative sexual embryo formation is being investigated by hybridization experiments.

508.

LANGLET, O.

634.975:575.22

Om variationen hos tallen (*Pinus silvestris* L.) och dess samband med klimatet. (On variation in the pine (*P. silvestris* L.) and its connexion with climate.)

Svenska SkogsvFören. Tidskr. 1934 : No. 1/2 : 87-110.

On a very large scale (as compared with previous race trials) Professor Hesselman undertook in 1928 a basic investigation into the physiological differences between Scots pine plants of different proveniences and the results of these observations are here discussed.

A connexion was established between the dry matter content, sugar content, etc., and the habitat climate of Scots pine plants; moreover a correlation was found between dry weight and frost resistance: so that the dry matter content of Scots pine collected under controlled conditions gives an idea of their frost resistance.

The variation of Scots pine is not connected with variation in chromosome number, which was found to be constant for plants from various countries, as is also the case with other species, e.g. Douglas fir and *Pinus contorta*.

Theories on the gradual nature of variation and the generic aspects of tree species, varieties, etc., occupy the rest of the paper.

509. BEAL, J. M. 634.975:576.353:581.162.4

Chromosome behaviour in *Pinus Banksiana* following fertilization.

Bot. Gaz. 1934 : 95 : 660-66.

The conflicting results recorded by other workers on chromosome behaviour after fertilization in species of *Sequoia*, *Pinus* and *Abies* and other plant species are described and compared with the writer's own detailed observations on *Pinus Banksiana* Lamb.

The main features of note in the embryonic divisions were : (1) the development of two groups of chromosomes and two spindles which merge ultimately into one multipolar diarch spindle with both maternal and paternal chromosomes in one group on its equator ; (2) the absence of "pairing" between maternal and paternal chromosomes and of any phenomena which could be definitely interpreted as the transverse segmentation.

510. LIESE, J. 634.975-2.19:575.242

Vererbung der Hexenbesenbildung bei der Kiefer. (The inheritance of witches broom formation in the pine).

Z. Forst-u. Jagdw. 1933 : 65 : 541-44.

As no pathogen was discoverable as a cause of the witches broom formation in the pine, it was thought that it might be an inherited phenomenon as in the fir investigated by von Tubeuf.

Seeds from cones taken from branches affected by the disease were sown and of the eight seedlings reared, five were stunted in growth and three were normal. It is therefore concluded that the phenomenon may be regarded as a mutation, inherited by the progeny and that the occurrence of normal plants is due to cross-pollination by normal pollen.

The root system of the stunted plants was also reduced compared with that of normal plants. The most typical witches broom trees seldom produce cones but others, only slightly affected, may yield heavily; this and other facts need further investigation.

VEGETABLES 635

511. 635.13:581.162.3:578.08

BORTHWICK, H. A. and EMSWELLER, S. L.

635.13:575.14

Carrot breeding experiments.

Proc. Amer. Soc. Hort. Sci. 1933 : 30 : 531-33.

Experiments on methods of self-pollination shew that the isolation of the whole plant by means of muslin cages into which flies were introduced as pollinating agents was entirely successful. It has been observed that in a single umbel the anthers dehisce and the entire stamen falls off before the stigmas are receptive; therefore no seed is ever set if a single umbel is isolated. This fact however indicated a simple method of cross-pollination, that of introducing an umbel of the desired parent with anthers at the dehiscent stage and flies as the pollinating agents in with the isolated umbel. Hybrid seed was successfully obtained by this method.

Several varieties shewed a high degree of self-fertility and no case of proved self-sterility was found.

There were indications of marked loss of vigour in the first inbred generation of certain varieties.

512. GEISLER, F. 635.24:576.312.35

Chromosome numbers in certain species of *Helianthus*.

Butler Univ. Bot. Stud. 1931 : 2 : Paper No. 6 : 53-62.

The chromosome numbers of a number of species of *Helianthus* are given including 102 as the diploid number for *H. tuberosus*.

513. GASSNER, G. and HASSEBRAUK, K. 635.31-2.452-1.521.6
Beiträge zur Kenntnis des Spargelrostes. (On the study of asparagus rust.)
Gartenbauwiss. 1934 : 8 : 455-76.

Artificial inoculation of over 13 varieties (or types of commercial origin) of asparagus with *Puccinia asparagi* DC. in field tests shewed that none were resistant and the average of infection was high.

From the fact that within the individual varieties the amount of infection varied, it is concluded that with very few exceptions they are genetically impure types in which segregation for resistance is still going on.

Since the well known Washington varieties too were reported from another source in 1932 not to be resistant the breeding of resistant types is all the more necessary. In addition to the impurity of existing varieties further difficulties in such work are the necessity of resistance tests being made in the field and also the difficulty of detecting possible race specialization of the causal organism.

514. KRAIEVOI, S. J. 635.5:576.356:537.531
[Influence of X-rays on the reproductive system (sexual) and on seed production in peas and vetch.]
Sovetskaja Botanika (Soviet Botany) 1934 : 1 : 74-84.

A study of the influence of increasing doses of X-rays on seed production and on the meiotic processes. With increasing dosage the meiotic irregularities become more pronounced; the seed production in *Pisum sativum vulgare* Alf. falls proportionately, in *Lathyrus sativus* it first rises and then with further increase in the dosage again falls.

The most favourable dosage for inducing mutations is given.

515. THOMPSON, R. C. 635.52:581.162.32
Natural cross-pollination in lettuce.
Proc. Amer. Soc. Hort. Sci. 1933 : 30 : 545-47.

Experiments to test to what extent cross-pollination may occur in lettuce shewed that under the conditions of the experiment 1:33 to 6:22 per cent of hybrid plants due to cross-pollination occurred among the progeny of the two varieties grown. It was observed that insects probably acted as pollinating agents.

516. WILSON, J. D. 635.53-2.484-1.521.6
Celery yellows in Ohio.
Bi-m. Bull. Ohio Agric. Expt. Sta. 1934 : 19 : 109-15.

Early observations on celery yellows, which is caused by *Fusarium* species, in Michigan indicated that the green varieties of celery were very resistant, the yellow varieties generally susceptible and the intermediate easy-blanching varieties also intermediate in resistance.

Field trials in 1932 and 1933 have shewn Columbia, a green variety and Michigan Golden, a yellows resistant selection derived from the tall strain of Golden Self-blanching to be very resistant, while the yellow varieties Golden Self-blanching, Hoover Special and Golden Phenomenal were highly susceptible. Superior to these three varieties in resistance were Florida Golden, Golden Prize, Early Fortune, Newark Market, Golden Plume, and Wonderful—all intermediate in characters between the true green and yellow types.

517. POOLE, C. F. and PORTER, D. R. 635.615:581.331.23
Pollen germination and development in the watermelon.
Proc. Amer. Soc. Hort. Sci. 1933 : 30 : 526-30.

A study of the effect of temperature on the rate of growth of the pollen tubes within the styles of *Citrullus vulgaris*.

518. YOUNG, R. A. 635.62
The Chayote. A little-known Guatemalan vegetable.
 Nat. Hort. Mag. 1933 : Pp. 6.

A description of this cucurbit and its alternative names are given, with remarks on methods of cultivation, time of flowering and fruiting, the possibility of obtaining an early fruiting type, and domestic and commercial uses.

519. SCOTT, G. W. 635.62:577.88
 635.62-1.547.5
Sex ratios and fruit production studies in bush pumpkins.
 Proc. Amer. Soc. Hort. Sci. 1933 : 30 : 520-25.

The ratio of staminate to pistillate flowers was determined for three bush varieties of *Cucurbita Pepo* planted on five successive dates. No consistent variation due to date of planting was observed.

In a second series of experiments on the same varieties data are given shewing the effect of allowing fruits to mature for varying periods on number of flowers produced, number of fruits set and weight of individual fruits.

520. THAYER, G. B. 635.62:581.481:575.11
Inheritance of cotyledonary characters in *Cucurbita Pepo*.
 Bull. Torrey Bot. Cl. 1934 : 61 : 263-69.

Seeds of a number of pure lines of *C. Pepo* and of F_1 and F_2 progenies from crosses between them were examined, 10 seedlings each of the pure lines and the F_1 and at least 20 for each F_2 progeny.

Though the character cotyledon size was complicated by marked environmental influences and by heterosis, it is controlled to a large extent by the size of the seed and is thus matroclinous in inheritance.

The shape (ratio of length to width) of the cotyledon appears to be influenced by seed shape but matrocliny is by no means complete and a certain degree of normal bi-parental inheritance and segregation was detectable.

Characters of vein pattern and cotyledonary surface seem to display ordinary inheritance.

521. PRICE, W. C. 635.63-2.8:576.16
 575.24:632.8
Isolation and study of some yellow strains of cucumber mosaic.
 Phytopathology 1934 : 24 : 743-61.

Evidence has been obtained to shew that strains of cucumber-mosaic virus arise from mutation or a similar process in tobacco plants having the cucumber mosaic disease.

It was demonstrated that strains of cucumber-mosaic virus may arise in primary lesions as well as in systemically diseased leaves of affected plants. One of the strains isolated during the investigations was found to be unstable and to yield additional strains on sub-inoculation.

Results were also obtained tending to shew that new strains of viruses capable of attacking entirely new host plants may arise naturally in some manner such as is tentatively suggested here.

522. YEAGER, A. F. 635.64:575
Tomato breeding.
 Bull. N. Dak. Agric. Exp. Sta. 1933 : No. 276 : Pp. 20.

The present paper gives a comprehensive account of the practical results of tomato breeding during the last 15 years at the North Dakota Experiment Station.

Early varieties of good quality were the main object and by crossing first with the earliest varieties and later by crosses with *Lycopersicum pimpinellifolium* very early strains have been bred. Other crosses are described which have produced satisfactory early determinate varieties both red and yellow and work is being continued for the production of uniformly coloured fruit and for further improvements.

523. HUMPHREY, L. M. 635.64:576.354.4:576.356.5
The meiotic divisions of haploid, diploid and tetraploid tomatoes with special reference to the prophase.
Cytologia 1934 : 5 : 278-300.

The diploid plant here described was obtained from the original haploid by decapitation and the subsequent vegetative production of buds from the callus. The tetraploid was derived from the diploid plant by the same treatment. Meiosis is described in detail in each type. There was no evidence of pairing at zygotene in the haploid which indicates that 12 represents the basic number for *Lycopersicum*. At metaphase-anaphase the distribution of the chromosomes is at random. Three spindles may occur at the second metaphase, which is otherwise regular. The rare production of normal pollen grains is the result of non-reduction. Meiosis is perfectly regular in both the diploid and tetraploid.

The details of meiosis in the tetraploid are discussed in relation to the observations of other workers.

Measurements were made of cells, nuclei and nucleoli at diakinesis and it was found that as the chromosome number increased there was a corresponding increase in the size of the cell, nucleus and nucleolus.

524. LESLEY, M. and LESLEY, J. W. 635.63:575.356.4:576.312.34
Tomato races with long and short A chromosomes. 635.64:575.127.2
Amer. Nat. 1934 : 68 : 463-64.

In the progeny of triploid tomatoes some races have been found with long chromosomes and other races with short ones (i.e. half the length of the long chromosomes) associated with the nucleolus at diakinesis in the pollen mother cells. The position of the trivalents in trisomic types showed that the A or first chromosomes are associated with the nucleolus. Minute transplants were found with both long and short A chromosomes. One race with long A chromosomes was outstandingly vegetative till late in the season and one plant of this race was partially male sterile, but two other long chromosome races were quite fertile.

Examination of *Lycopersicum pimpinellifolium* and its F_1 hybrids with three wild races of *L. esculentum* showed that apparently the nearest wild relatives of the cultivated tomato have short A chromosomes whereas both long and short A races occurred in the progeny of three triploids of the cultivated tomato.

L. peruvianum Dunal which on being crossed as the ♂ parent with the tomato produces seedless fruits has a pair of large A chromosomes associated with the nucleolus and very like the A chromosome pair in our long-A races.

Segregation of long and short A races (which may both be entirely fertile) might occur in cultivated tomatoes if they were of hybrid origin or as a result of mutation.

The relative sizes of the chromosome in long-A plants are estimated.

525. KOSTOFF, D. and KENDALL, J. 635.64:576.356.5
Studies on polyploid plants. III. Cytogenetics of tetraploid tomatoes.
Gartenbauwiss. 1934 : 9 : 20-44.

A number of tetraploid plants were obtained by decapitating the stems of diploid plants of the variety Micado and subsequently inoculating the callus tissues with *B. tumefaciens*. The young shoots were then grafted on to normal plants to insure their development and three generations were obtained by selfing.

In comparison with the diploid plants, the tetraploids were more robust with broader and darker green leaves, the laminae of which instead of being flat were more or less crinkled. Flowering was 10-60 days later, and fruits of the same size as the diploids but with fewer seeds were only obtained by artificial selfing.

The cells of the tetraploid were definitely larger and more variable in size than those of the diploid; those of the wild *S. pimpinellifolium* were smaller than the diploid, the cells of their hybrid being intermediate.

The same types of chiasmata were found in the tetraploid as in the diploid. In the tetraploid 3-9 quadrivalents were observed. Most of the configurations could be explained on the assumption of association between homologous chromosomes, two configurations however suggested that association might occur between non-homologous parts.

A certain amount of irregularity in the distribution of the chromosomes during meiosis was noted, due chiefly to non-disjunction of the quadrivalents.

The elimination of lagging chromosomes led to the formation of gametes with less than 24 chromosomes.

Restitution nuclei were occasionally observed.

The percentage of viable pollen in the diploid was 97-98, that of the tetraploid 75 per cent. In size the pollen grains of the tetraploid were on the whole larger than those of the diploid.

The difficulty of finding a suitable medium for the germination of the tetraploid pollen grains was overcome by the use of the stigma secretion of *Nicotiana*. The larger pollen grains had definitely thicker pollen tubes than those of the diploid, which would probably retard their progress through the stigma.

The plastids of the tetraploid were not larger than those of the diploid but were if anything smaller.

Crosses between diploid and tetraploid were unsuccessful. When the tetraploid was used as the female parent some small fruits formed, but no seed germinated. The effect on the embryo of crosses between diploid and tetraploid plants is discussed. A hypotetraploid plant with 47 chromosomes is described and the occurrence of a sterile plant with 48 chromosomes but with such marked irregularities at meiosis that it is suggested that it is a pseudo-tetraploid originating from aberrant gametes with 23 and 25 chromosomes.

The possible origin of tetraploid tomato plants and their practical value are discussed.

526. HUSKINS, C. L. 635.64:576.356.5:575.114

Anomalous segregation of a triploid tomato.

J. Hered. 1934 : 25 : 281-86.

A triploid plant which originated as an adventitious shoot from the callus of a tomato stock grafted with a scion of *Solanum luteum* eventually produced two fruits and of their 22 seeds 11 germinated and produced mature plants.

The parent triploid and the progeny were cytologically examined. The parent shewed 36 chromosomes, 12 of different shapes and sizes being more or less distinguishable and were represented three times. The progeny were all tetraploids.

The difficulties in accounting for this result are discussed.

527. GUBA, E. F. 635.646-2.484-1.521.6

Control of the verticillium wilt of eggplant.

Phytopathology 1934 : 24 : 906-15.

The study of the reaction of many varieties of eggplant shewed no varietal specialization of the fungus and emphasizes the total lack of any material for selection or hybridization purposes. In any attempts to breed or select for resistance the importance of allowing for the correlation (found by the writer) between the manifestation of the disease and fruit setting and fruiting habits must not be disregarded.

528. 635.648:575.127.2:575.11

CHIZAKI, Y.

635.648:575.127.2:576.312

(Breeding of a new interspecific hybrid between *Hibiscus esculentus* L. and *H. manihot* L.)

Proc. Crop Sci. Soc. Japan 1934 : 6 : 164-72.

From *H. esculentus* x *H. manihot* 48 F₁ plants were obtained and on selfing 8 and 30 plants were obtained in the F₂ and F₃ generations respectively.

The F₁ shewed hybrid vigour and were in general intermediate between the parents. In form,

growth and habit the F_2 and F_3 individuals were uniform and resembled the F_1 , though the F_2 and F_3 stems were thick.

In the pollen mother cells the formation of restitution nuclei often occurred.

Root-tip cells of *H. esculentus* contained 126–134 somatic chromosomes and those of *H. manihot* 60, while in the F_1 and F_3 generations the number was ± 98 and ± 192 respectively. During the stage of tetrad formation in F_1 dyads (91.68 per cent) and tetrads (6.85 per cent) were observed with occasional monads, triads, quintads and hexads. The F_1 pollen comprised large and small grains, the former are presumed to have originated from the dyads and the latter from the tetrads—a relationship which tended to be repeated to some extent in F_2 .

It is concluded that the new form in F_2 is an amphidiploid derived from the dyads of the F_1 pollen.

529.

CREBERT, H.

Beiträge zur Züchtung einjähriger Hülsenfrüchte. (**Notes on breeding annual legumes**).

Z. Zücht. 1934: A 19: 526–49.

635.65:575

633.3:575

Most leguminous plants are rather highly specialized ecologically and the first essential in breeding them is to study the ecological conditions of the region for which they are designed and select only those lines ecologically adapted. For the same reason any judgment must be made on properly replicated field tests with large samples so as to avoid the effect of local variation obscuring the genotype. The number of seeds per pod was, except in the case of vetch and field peas, not a good criterion of yield. Size of seed was a constant genetic character but selection of too large or too small seeds had a depressing effect on yield.

The chromosome numbers being small, linkage between the characters is very frequent and cross-over forms are rare. This means that it is essential that both parents in a cross shall be ecologically suited. Crosses within the species produced very few new forms and frequent recourse has been had to crosses between species or subspecies.

The author's experience in breeding the individual crops at Weihanstephan is discussed at length. It has been found unnecessary to bag broad beans (*Vicia Faba*) except for pure genetic studies. Under certain circumstances cross-pollination of up to 7 per cent was however observed. Time of ripening is one of the most important considerations in breeding. Maturity was best determined by the blackening of the pods or stalks. Too early forms suffer more from attack by *Bruchus R.*, aphids and other pests. In addition to a suitable time of ripening it is desirable that the plant should remain green as long as possible and then ripen rapidly.

There seems to be a tendency for lines subjected to repeated and intensive selection to display chlorophyll anomalies and reduced vigour. In addition to the strong linkages referred to by Sirks (see "Plant Breeding Abstracts," Vol. II p. 218) the zygote sterility and reciprocal differences observed in crosses between *Vicia Faba major* and *V. F. minor* present considerable difficulty to the breeder though the linkage of flower and seed colour can often be put to good use. The F_2 generation usually had fine rounded beans with bright shiny seed-coats, which characters in later generations gradually diminished and returned to normal. Plants displaying these characteristics in later generations invariably segregated and the phenomenon is ascribed to heterosis; it was not observed in crosses between *major* and *minor*.

Climatic difficulties make a large seeded pea impossible to grow successfully and breeding is directed towards a pea of medium size, mid-early, with regular germination; the lines that germinated late and irregularly were more susceptible to *Fusarium vasinfectum*. Cases of bud variation and of complex segregation following upon out-pollination were observed.

In lupins clear varietal differences in susceptibility to foot-rot were observed, the large-seeded ones being the most resistant. Set of pods and seeds on the main axis was the best character on which to make selections. Segregation after crossing was simple and homozygosis rapidly attained. Heterosis was observed in respect of a number of characters.

Continued selection has failed to produce leguminous crops with a sufficient degree of winter-hardiness; the only hardy species are *Vicia pannonica* and *V. villosa*. Glabrous forms of the latter species were not hardy.

In soya beans forms of sufficiently early maturity have been obtained by selection but the author doubts whether it will be possible ever to breed forms fully adapted to European conditions. This will in any case only be possible by testing a large range of varieties and probably by crossing.

Observations on field peas and vetches are also reported.

530. FRETS, G. P. and WANROOY, G. 635.652:575-18:581.47
 Die Erbllichkeit der Bohnenform und des Bohnengewichtes bei *Phaseolus vulgaris*. II. Die kreuzungen. (The inheritance of shape and weight of the bean in *P. vulgaris*. II. The crosses.)
 Genetica 1934 : 16 : 297-314.

Continuing the previous study (see "Plant Breeding Abstracts," Vol: V, Abst. 189) a number of reciprocal crosses was made between plants from two lines, I and II, line I having long, broad and flat or thin beans and line II short, narrow and fat beans.

Twenty-two I x II and eleven II x I crosses yielded 66 and 40 beans respectively.

In respect of length the F_1 beans were often equal to the female parent, in breadth and especially in thickness not as often so but in all cases they were nearer to the female than the male parent. The mean values for length, breadth and thickness of the hybrids were almost identical with those of the female parent, notwithstanding the fact that the length and breadth were larger and thickness smaller. The various indices were closer to those of the female parent than the dimensions themselves, especially those not involving thickness, the dimension corresponding least closely to the maternal.

In the reciprocal crosses the thickness was equal to that of the maternal form with a tendency even to be greater and the length was nearer to the maternal values than to the paternal; the breadth was about the same as in the direct cross. Again the indices shewed a still greater approximation to those of the maternal form. It is pointed out that the approximation of a dimension to the maternal value is greater when the female is higher than the male parent than when it is smaller. This, combined with the fact that the indices approach the maternal form closer than do the dimensions, results in the thickness exceeding that of the maternal form in the reciprocal cross.

The weight of the beans from both the direct and reciprocal crosses was almost equal and corresponded to the weight of the heavier parent.

The results of other workers are discussed.

531. PRAKKEN, R. 635.652:575.11.061.6
 635.652:575.11:581.47
 Inheritance of colours and pod characters in *Phaseolus vulgaris* L.
 Genetica 1934 : 16 : 177-296.

With the main object of investigating the inheritance of strength of string a study was made of the F_1 - F_4 generations from a French bean cross between Fijne tros, a rather late, white flowering, white-seeded pole bean with non-parchmented, nearly stringless pods and Wagenaar, an early bush bean, very pale rose-flowering and yellow-seeded with semi-parchmented pods with extremely strong strings.

Most of the present paper deals with the intricate segregation observed for seed coat colour.

As regards strength of string, which depends mainly on the percentage of fibres in the sheath of the vascular bundles in the dorsal and ventral sutures, the F_1 was intermediate though approaching the Fijne tros type, in F_2 and F_3 the pure stringy Wagenaar (*st st*) type reappeared in a clearly unifactorial way and bred true.

The inheritance of tough or parchmented pod wall, due to a fibrous layer between inner and outer parenchyma, was also investigated. In the Fijne tros race this layer is lacking and in the Wagenaar race it is rather weak. In the F_1 the fibrous layer is extremely thick and hard, all its cells being lignified. Subsequent generations revealed that the segregation for non-parchmented (*to to*) and parchmented (*To To*) pod wall was unifactorial. Whether intensifying factors for *To* were involved was not clear.

An extensive bibliography completes the paper.

532. PIERCE, W. H. and WALKER, J. C. 635.652-2.8-1.521.6:575.42
The development of mosaic resistant Refugee beans.
 Canner 1933 : 77 : No. 26 : 7-9.

The Corbett Refugee bean was developed from a single mosaic resistant plant in a field of severely infected Refugee beans in 1929. Crossing with the Refugee Green gave completely resistant hybrids which segregated in F_2 for resistance and susceptibility, and by continued selection for resistant types which had also as far as possible the desirable Refugee Green characters, ultimately families were isolated which were as completely resistant as the Corbett Refugee parent. Two of these strains W-1 and W-3 resembled Refugee Green and are resistant to common bean mosaic (but not the yellow bean mosaic). W-1 is valuable for its earliness and W-3 excelled in the production of the smaller and more desirable type of pod and also outyielded Refugee Green. In canning tests both W-1 and W-3 equalled or surpassed Refugee Green. The new strain W-1 has been named Idaho Refugee, and W-3, Wisconsin Refugee.

533. PIERCE, W. H. 635.652-2.8-1.521.6:575.42
Resistance to common bean mosaic in the Great Northern field bean.
 J. Agric. Res. 1934 : 49 : 183-88.

Nine high yielding, resistant selections from commercially grown Great Northern beans were tested for resistance to common bean mosaic in the field and in the greenhouse. A small percentage of the plants showed infection by another type of virus causing a disease named yellow bean mosaic. This virus most readily attacked plants susceptible to the common bean mosaic but on such plants it is not easily recognized. Yield trials showed that the resistant selections were significantly higher in yield than the commercial and susceptible strains. Variations in length of growing season, plant type and seed type were noted among the selections but there was no segregation for resistance or other plant characters.

Three of these resistant strains UI 1, 59 and 81 are now being grown commercially in Idaho.

534. VEATCH, C. 635.655:576.312.35
Chromosomes of the soybean.
 Bot. Gaz. 1934 : 96 : p. 189.

The diploid number of 40 chromosomes found in the Illini variety of *Soja max* (Piper) corresponds to that reported by Karpetschenko for *S. hispida* (Mönch).

535. HARTER, L. L. 635.656-2.484:576.16
A new wilt of peas.
 Phytopathology 1934 : 24 : 950-51.

Plants of wilt resistant varieties and strains as well as susceptible varieties often exhibit symptoms not characteristic of common wilt (*Fusarium orthoceras*), and two or three species of *Fusarium* differing specially and pathogenically from the pea wilt organism have been isolated from affected plants and are here briefly recorded.

BOOK REVIEWS

HARTMANN, M. 57
 Allgemeine Biologie. Eine Einführung in die Lehre vom Leben. (**General biology. An introduction to the science of life.**)
 Gustav Fischer, Jena 1933: 2. Auflage. Unbound RM. 38, bound RM. 40.
 Pp. xii + 792. 660 illus.

The second edition of Professor Hartmann's famous work, very much enlarged and brought up to date. The first chapter is devoted to a general study of the cell. Much the longest chapter is entitled "the alternation of forms," under which heading the author discusses (1) the phenomena of reproduction, including cell division and the fundamental chromosome phenomena, alternation of generations, senescence and allied subjects; (2) fertilization and sex, involving discussions of reduction, heterothallism and sex determination; (3) inheritance, a brief but comprehensive review; (4) physiology of development, mainly concerned with the animal kingdom and (5) the origin of species and evolution.

The volume is excellently illustrated and contains a classified bibliography of 23 pages.

KAPPERT, H. 575:635
 Grundriss der gärtnerischen Pflanzenzüchtung. (**Fundamentals of horticultural plant breeding.**)
 Paul Parey, Berlin 1934: RM. 6. 80. Pp. 148. 29 illus.

In choosing a treatise on the elements of Mendelism the practical reader, both English and German, has a fairly wide choice. Not so if he desires a manual written from the angle of the practical breeder but embodying the more recondite features of modern genetics. The present volume supplies such a need. The minimum of space is given up to the inheritance of one, two and more simple characters and the author passes on immediately to discuss the nature of the resulting populations, on the basis of which the principles of selection are explained. The influence on the composition of the population of various effects disturbing the segregation ratios is discussed, leading to a description of the back-cross method and its importance. The various linkage and sterility phenomena are discussed, then the chromosomal phenomena and irregularities that influence them, and the phenomena of mutation, chimaera formation and heterosis; the technique of hybridization and of yield testing is outlined, all from the point of view of the practical worker who wishes to acquaint himself with the most recent ideas and methods in plant breeding.

ENRIQUES, P. 575.1:576.312.32
 Le leggi di Mendel e i cromosomi. (**The laws of Mendel and the chromosomes.**)
 Nicola Zanichelli, Bologna 1932: Pp. 224. 54 illus.

This work represents the prize essay on the subject and treats in a general way the laws formulated by Mendel, those which have been discovered by later workers and the relation of the chromosomes to such laws.

JONES, W. N. 575.25
Plant chimaeras and graft hybrids.

Methuen & Co., Ltd., London 1934: 3s. 6d. Pp. viii + 136. 21 illus.

The standard work on the subject of chimaeras and allied phenomena, which are more and more being called upon to explain unusual genetic phenomena, is the German edition of Krenke's "Wundkompensation, Transplantation und Chimären bei Pflanzen" (see "Plant Breeding Abstracts" Vol. IV, p. 253) published in 1933. No English version exists and Professor Nielson Jones has done a useful service in bringing together for the English reader the main phenomena,

with appropriate citations and reference to sources of further information. All the main "classical" cases are reviewed and explained from the modern point of view. An attempt is made to give the view of Professor Lucien Daniel and others on "graft hybrids" in a form compatible with botanical science but nevertheless the crucial feature of the hypothesis, namely the fusion of the two vegetative nuclei, still lacks demonstration. The well-known cases are passed in review and all shewn to be susceptible of a chimaeral interpretation. Reference is also made to the more recent work of Krenke on these and similar lines. Other types of chimaera are described and special reference is made to the frequency of somatic segregation and mutation, a factor underestimated in the past, in the production of chimaeras and the phenomena associated with them.

STUBBE, H. 575.41
 Natürliche Zuchtwahl. (**Natural selection.**)
 Brehm, Berlin 1934: R.M.0.90. Pp. 29. 2 illus.

A popular presentation of the principles of natural selection, starting with an exposition of the phenomena of variation, non-hereditary, segregational and mutational, their influence on the population and the actions and effect of natural selection on such a population. Finally the results of artificially discontinuing natural selection in such a population are graphically illustrated by reference to human society.

RAGALLER, F. 575.7
 Der Abbau. Eine entwicklungsgeschichtliche Studie zum Senilitäts- und Fortpflanzungsproblem. (**Degeneration. An ontogenetic study of the problem of senility and reproduction.**)
 Gustav Fischer, Jena 1934, RM. 5.60. Pp. 85. 3 illus.

In the present monograph the author views the problem of senility and degeneration from the point of view of the living cell, of the metabolism of cell growth and cell division. The phenomena of cell division and sexual reproduction are considered at length and shewn to be two different ways of satisfying the same requirements of the organism. The author has endeavoured to put this difficult subject on a scientific footing by a re-examination of both the facts and their interpretation.

ZIMMERMANN, W. 576.1
 Grundfragen der Deszendenzlehre. (**Fundamental questions of phylogeny.**)
 W. Kohlhammer, Stuttgart, 1934: RM. 1.35. Pp. 32. 7 illus.

Based on a public lecture to the University of Tübingen, the present study gives in brief outline the author's views on the origin of plants, viewed "as a dynamic process, not statically." The origin of cultivated forms is the first aspect to be considered, wheat serving as the example. Following upon this the author gives a summary of his own studies on the origin of the various forms of an entirely wild plant, *Anemone Pulsatilla*, leading to a consideration of the phylogenetic processes in geological times; the conclusion is reached that the processes are in all essentials the same as those deduced from a study of cultivated plants. "Adaptation" is the keyword of the process and controversy arises only in interpreting the means whereby this adaptation is brought about.

BAKER, J. R. 576.3:578.6
 Cytological technique.
 Methuen & Co., Ltd. London 1933: 3s. 6d. Pp. x + 126.

Though designed for students of animal cells, Dr. Baker's book will be of almost equal use to beginners in plant cytology. The author describes not so much the technique as the principles

of cytological methods, going into the mode of action of each reagent used, in order that the student may from the beginning understand the reason for the various processes and so be in a position to modify them if required. The author enlarges at particular length on the nature of the main fixatives, after which the best fixing mixtures and their use are described. Stains and staining are treated on similar lines and the volume ends with short notes on mounting.

CHOUARD, P. 581.165
La multiplication végétative. (**Vegetative multiplication**).
Hermann & Cie, Paris 1934 : 10 fr. Pp. 48. 51 figs.

LEDERER, E. 581.19
Les caroténoides des plantes. (**The carotinoids of plants**).
Hermann & Cie, Paris 1934 : 18 fr. Pp. 82. 1 fig.

SOUÈGES, R. 581.3
L'embryologie végétale. Résumé historique. 1^{re} Epoque : Des origines
à Hanstein (1870). [**Plant embryology. Historical summary. 1st**
Period : From the beginnings to Hanstein (1870).]
Hermann & Cie, Paris 1934 : 12 fr. Pp. 57.

L'HÉRITIER, P. 576.41
Génétique et évolution. III. Analyse de quelques études mathématiques
sur la sélection naturelle. (**Genetics and evolution. III. Analysis of**
mathematical studies on natural selection).
Hermann & Cie, Paris 1934 : 14 fr. Pp. 43.

Of these four numbers of the series of "Actualités scientifiques et industrielles," the first describes the various methods of vegetative propagation in the plant kingdom, the second gives a summary of the results of modern research on the plant carotinoids (including a bibliography of 201 references), the third is an historical review of plant embryology from the first work on this subject to 1870 and the fourth is a summary of R. A. Fisher's "The genetical theory of natural selection" including a study of the views of evolution of the American geneticist Dr. Sewall Wright.

ZHUKOVSKY, P. 581.9(56)
(**Agricultural Turkey**). 63(56)
Lenin. Acad. Agric. Sci., Inst. Pl. Ind. Moscow and Leningrad 1933 : Pp.
xxvii + 908 : 381 figs. 12 pls.

This large tome, comprising some 800 pages of original text represents the fruits of three Soviet expeditions, headed by the author, to Asia Minor. The expeditions have been the means of accumulating a vast amount of plant material, much of it new and of extreme value, some for immediate introduction, some for breeding.

The general characteristics of the country and its climate are described, followed by chapters on the natural and agricultural flora of the principal zones and the agriculture of the region in general.

In the second section, comprising the main body of the work, detailed descriptions are given of the forms and varieties collected in each individual crop, constituting an invaluable contribution to the Soviet fund of initial breeding material. Particular interest is attached to the discovery of spring forms of *Triticum durum*, among which appear some extremely early varieties, others unaffected by high temperatures, *Fusarium* and frit-fly; barleys have been found with unusually

large grain and high yielding capacity and with high protein content ; poppies with record earliness, opium content and drought resistance ; greatly superior forms of aniseed ; melons excelling any in the world in sweetness, juiciness, thickness of the flesh and transportability ; cold-resistant winter oats, *Avena byzantina* ; sesame resistant to *Fusarium* ; flax capable of yielding both fibre and oil ; *Phaseolus* immune to anthracnose ; and a great abundance of forms of rye and a number of other crops, in some character or other superior to the ones previously known.

The investigations have succeeded in demonstrating that Anatolia is the centre of origin of many of the best European cultivated plants. The cultivated type of soft wheat, the squarehead type in particular, apparently originated in Anatolia and penetrated into Europe later ; the same is true of the cultivated forms of the European leguminous plants, the best forms of sesame, the table carrot, cultivated aniseed, the cantaloupe and casaba melons, cucumbers, French lucerne, the opium poppy, various fruit trees and wine grapes. Literally thousands of cultivated forms of these several plants have been found. In wheat the greatest variety is found in *T. durum*, including many endemic forms and characters. The well-known Kubanka wheat is present in great variety, indicating that it too has in all probability entered Russia from Anatolia. There are endemic forms and characters also of *T. turgidum* and two species of wild wheat are present in abundance. The country is divided into very varied climatic regions and in consequence the wheats display a wider range of ecological types than those of any other *durum* wheat country ; even in Abyssinia, the country of the greatest botanical diversity, the ecological type is relatively uniform. Some of the new forms of *T. durum* have already been used in crossing on account of their low temperature requirements, tolerance of excessive moisture and immunity to *Fusarium*, all of which characters are required for extending the northern limit of *T. durum* cultivation. The variety *asiaticum*, besides being immune to *Fusarium*, entirely escapes frit-fly attack owing to its earliness, low tillering and vigorous and rapid early growth. The dwarf *T. durum* comes into ear earlier than any other known forms and is hence extremely valuable for certain parts of the U.S.S.R. Hybrids of this are in the third generation. Another valuable breeding character of these wheats is the high quality of their grain, the variety *horanicum* having excellent vitreous grain of spherical shape, maturing very early. Some of them also respond favourably to vernalization.

The botanical variation in these wheats is equally great, especially in the Mediterranean region of Anatolia, which is regarded therefore as an important, though not the primary, centre of origin of the 28 chromosome wheats. The 42 chromosome group shews much less diversity, except *T. compactum*, which may have a secondary centre in Anatolia and Transcaucasia. A new and endemic 42 chromosome species, *T. Vavilovi*, characterized by branched ears, has been discovered, however, and is here described. The 14 chromosome group of wheats and the genus *Aegilops* have their centre of greatest diversity in Anatolia and the Crimea and two new species of *Aegilops* have been found there.

The barleys of Anatolia are much less varied but nevertheless are of breeding value for their drought resistance, strong straw, non-shattering ears and large elliptical grain which shews considerable variation in protein and starch content.

Rye is found universally, as a weed in all the wheat fields and also as a pure crop. These ryes display a greater diversity of varieties, forms and characters than is found in any other country, in the form and colour of the ear, which varies from yellow to black ; in the form and colour of the grain, varying from elongated to nearly spherical and from yellow, green and purple to nearly black ; awnless forms appear, forms with smooth, pubescent and warty glumes ; forms with branched ears, others with three grains per spikelet, types with wax and types without, and certain self-pollinating ryes. Many of these forms are new and endemic ; a new wild species, *Secale ancestrale*, has been found in great abundance and in a great variety of forms, as well as the common wild *S. montanum* and the allied genus *Haynaldia villosa* (= *Secale villosum* L. syn. *Triticum villosum*). The extreme heterozygosity of the ryes of this region is thought therefore to be the result of frequent intercrossing between the various forms and species and there is no doubt that this is the centre of origin. *Secale fragile* also occurs but there is evidence that the area of development of the hybrid forms is distinct from that of the original species. *Haynaldia*

hordeacea is thought to have possibilities for crossing for producing a perennial rye for the north and for arid zones; similarly *H. villosa*, *S. ancestrale* and *S. montanum* for producing drought-resistant forms and forms suitable for sandy districts.

Avena byzantina has been grown in Anatolia from ancient times. It is cultivated as a winter crop and is a common weed. It is present in a great variety of forms, some endemic; it is rich in winter and semi-winter forms which are of great use in certain parts of the U.S.S.R., and in addition to cold resistance have large grains with high content of protein and oil, and are resistant to rust, shattering and lodging; some are also very early and altogether this is regarded as the most valuable material for oat breeding yet found. There is a great variety also of wild *Avena* and Anatolia is regarded as the centre of origin of a whole group of oat species; the process of its gradual conversion from a weed to a cultivated plant can be observed at the present time in the wheat fields; the weed forms contain a much greater wealth of variation than the cultivated forms and many of them are endemic. Natural hybridization is common and the progeny of these natural hybrids often contains further new forms, some of which moreover are extremely similar to Burt and other new hybrids obtained from the U.S.A.

Maize and rice, which are introduced crops, are much more uniform.

Many of the leguminous plants on the other hand display a tremendous variety, e.g. the variation in seed form, vegetative period and morphological characters in the grams (*Cicer arietinum*) mark this as one of the most valuable known sources of breeding material. Anatolia is second only to Persia in richness of species of *Cicer*; there are five wild and two endemic species, though the supposed wild ancestor of the cultivated gram, viz. *C. judaicum* is not present. The examination of the wild species leads to the suggestion that several of them have contributed to the origin of the cultivated forms, possibly partly by hybridization; this view can only be substantiated by genetic study of the wild species. Anatolia contains a large number of endemic varieties, recessive characters being predominant; the Anatolian grams excel all others in quality and most others also in yield.

Of lentils a considerable range of varieties is found, including the intermediate as well as large and small-seeded varieties of *Lens esculentum* and all the four wild species. In opposition to Barulina's view the author thinks it likely that the large-seeded forms have arisen by hybridization of the original small-seeded form with some of the wild species such as *L. Kotschyana* or *L. orientalis*, leading to the independent origin of lentil cultivation in the Mediterranean, where the different type of cultivation, e.g. winter sowing, made possible the evolution of the forms with larger seeds. The position with regard to beans (*Vicia Faba*) is different, in that the small-seeded forms are much rarer, no endemics are found and the general character of the crop corresponds to that of the Mediterranean countries. They are nevertheless of great practical interest for breeders on account of their large beans, earliness and high quality; similarly with regard to *Phaseolus*, some of which are resistant to drought and others to anthracnose.

Although Anatolia is the home of all the wild species of *Pisum* hitherto known, *P. sativum* is very little grown and the forms cultivated are much less varied than those of Afghanistan and Abyssinia. Two new species have recently been discovered in Georgia and these may shed light on the origin of the cultivated pea; at present however there is very little relationship between the cultivated and the wild species. The Anatolian group represents a distinct type from the peas of Afghanistan and Abyssinia; in ecological characters it is very much more varied, including its reaction to reduced length of day, and although there are many isolated characters shewing the influence of Afghanistan, Transcaucasia and the Mediterranean countries it is clear that the peas of Anatolia have for a long time evolved independently.

Vetches on the other hand are present in remarkable abundance and variety, both as wild species growing as weeds and cultivated forms of *Vicia sativa*, the majority of which are endemic. Most of the characters are common to the cultivated and weed forms, the latter being richer in characters and it seems probable that in this region the process of "domestication" is still in progress. The group is in every way distinct from the two subspecies hitherto recognized and is established as a separate subspecies *turcica*. Among the general characteristics of this group are smallness of plant, extreme earliness, cold resistance, abundant seed production and firm

attachment of the seed coat. Earliness and abundant seed production are characteristic of the Anatolian *Lathyrus*, of which two cultivated species *L. sativus* and *L. ochrus* occur.

Special interest is attached to the sesames on account of their great diversity and their high quality. Most of them have white seeds, these varieties being endemic; they are also characterized by high oil content and very pronounced resistance to diseases, such as *Fusarium*, bacteria and gumming. Of linseed too there is a whole endemic group, intermediate in character between the Asiatic and Mediterranean groups; there is a further prostrate form in many ways resembling the wild forms, endemic for Anatolia and Transcaucasia, and capable of withstanding very low temperatures and growing in poor, sandy situations. The high yield of capsules and the large seeds, combined with their high oil content have directed the attention of breeders to the Anatolian linseeds.

Anatolia is apparently the home of aniseed. *Pimpinella anisum* grows wild in certain parts of the country and there is an unusual variety of cultivated forms. These yield more heavily than the forms of any other country, though in essential oil content they are inferior to the Spanish forms. However, a new species, *P. anisetum*, endemic in eastern Anatolia, has been found, remarkable for its high oil content (8.3 per cent as compared with 3.4 per cent for *P. anisum*), its vigorous growth, high yield and pronounced cold resistance. It is a biennial and very resistant also to fungous diseases. Its one defect is that the essential oil it yields is of a somewhat lower quality, containing as it does a smaller proportion of anetol.

Wild oleander, jasmine, rosemary, lavender (*Lavandula Stoechas* L.) and other aromatic plants are also found in abundance.

The local cotton is *Gossypium herbaceum* but adventive species such as *G. hirsutum* and *G. punctatum* are also present, all of distinctly low quality.

A special endemic subspecies of the opium poppy, consisting of several distinct ecotypes, is described. It is regularly accompanied by semi-cultivated types belonging to the dehiscent subspecies *semispontanum*, thought to be nearly allied to the wild ancestor of the cultivated poppy. The high morphine percentage and early maturity of the cultivated forms, together with their tolerance of both cold and drought have attracted the attention of Soviet breeders. Their yield of opium is unfortunately low and they are being crossed with Soviet forms having high opium content in the attempt to combine this with their high morphine percentage which in some cases was as high as 28.33 per cent. A study of the present distribution of the cultivated poppy together with the genetic and cytological investigation of it and of the Mediterranean wild species *Papaver setigerum* have led to the conclusion that this is not the wild ancestor of *P. somniferum*. The greatest number of forms and characters is found in the Central Asiatic Republics of the Soviet Union, where three endemic subspecies occur and which must therefore be regarded as the scene of origin of the cultivated species. In Turkey also there occur primitive forms with dehiscent capsules, and with warty capsules of the type used for producing edible seeds, and the present Anatolian and Persian forms are thought to have evolved later from forms originally coming from Turkestan. The great variety and wide distribution of cultivated poppies of the present day has arisen mono-phyletically, as the result of man's agency.

Each vilayet has its own peculiar type of melon, resulting from age-long selection independently of neighbouring vilayets. An untold wealth of forms has thus originated. Of these frequently only the most inferior have penetrated into other countries. The true melons constitute an endemic group *gracilior*, some of which are of exceptionally high quality, with a sugar content higher than any known melon, exceeding 9 per cent in some cases. One of the casaba melons found has been pronounced the best melon in the world on account of its combination of sweetness, juiciness, thick flesh and "buttery" consistency. It is to be used in crossing with more aromatic types of melon. The vilayet of Van is famed as the home of the cantaloupes and still contains a great variety of forms, many of which have not hitherto penetrated into Europe, whilst the snake melons also have their centre of diversity in Anatolia. Of watermelons both the cultivated and weed forms exist in great diversity, also as a special group *gracilior*, inferior however to the watermelons of Persia and neighbouring countries. Again *Cucurbita Pepo*

has a special Anatolian subspecies, *turcica*, representing the greatest variety of forms known in Europe, in addition to which there occur peculiar bushy forms. It is significant that the Anatolian forms of all the various cucurbit species, including the cucumbers, are characterized by the same group of botanical features, viz. that associated with the type *gracilior*. New botanical groups are established within the respective species, each consisting of a number of botanical varieties, all of which are endemic and are described; each has a clear regional distribution, which is indicated. It is clear that Anatolia is the primary centre of origin of the melons and an important secondary centre for the pumpkins and watermelons. Even the cucumbers, which penetrated from India, have to a certain extent evolved and produced a characteristic local type.

As regards the other vegetables great variability was found among the beets, not only in morphological but in biological and ecological characters; a whole group of orange-coloured beets is endemic in central and eastern Anatolia, a group having exceptional interest as breeding material. Again in the case of carrots, all the characters and all the forms known to exist in the cultivated carrot are concentrated in Anatolia, both those associated with the Asiatic and with the European groups, both of which are represented; moreover, a much greater range of variation has been disclosed by this material than was known to exist in the carrot and new possibilities in breeding have been opened up. In addition to typical European and typical Asiatic types, all possible intermediates are found not in respect of one character alone but in respect of all distinguishing characters. Investigation has shewn that the Asiatic carrots are lacking in plastids, the pigment being in the cell sap, whereas the European group owes its colour entirely to the plastids; hybrids between them contain pigment of both kinds and so also do the intermediate forms occurring in Anatolia. In addition there is an endemic group distinguished by the very large dimensions of the whole plant and more nearly allied to the wild subspecies *Daucus Carota* subspecies *Maximus*. This new group, named *Adanensis*, also contains purple and yellow forms corresponding to those occurring in the cultivated group. The concentration of forms in Anatolia is evidently the result of the overlapping in this area of the two wild subspecies *D. Carota* subspecies *Carota* and *D. Carota* subspecies *Maximus* from whose hybridization the European group of cultivated carrots has evidently arisen. Anatolia is thus regarded as the primary centre of origin of the European group as well as the secondary centre of origin of the cultivated carrot as a whole. Although nearly the whole range of the variation of carrots found in Anatolia, with the exception of the endemic Anatolian forms, occurs also in the various countries of the Soviet Union, the Anatolian populations are more regular in form and size of root and are therefore useful for breeding. Some of them contain a valuable essential oil, lemonene, and most have the advantage of being drought-resistant and, finally, their richness in characters makes these carrots an invaluable starting point for genetic studies.

The Anatolian cabbages are characterized by pronounced response to the influence of length of day, to which the European cabbages are more or less neutral.

The cabbages of Anatolia are more drought-resistant than any yet known; they are very susceptible however to *Peronospora brassicae*. In addition to cauliflowers there are specimens of the headless cabbage (var. *acephala*) and hybrids between them shewing vegetative segregation. Hybrid forms between *acephala* and the headed cabbage were also found. Many of the forms of the cabbage group are of a semi-cultivated type and some are endemic; the variety of the forms of the oriental group is greater than in neighbouring countries to the west and there are indications that the Anatolian cabbages form an ancient group in the origin of which the Syrian group has participated. They contain many forms and characters of value to Soviet breeders and will be used both in analytical and synthetic breeding.

Quantities of wild olives are found growing even in most unfavourable situations and poor mountain soils. There is also an abundance and variety of figs, of wild species and forms of pears, plums, cherries, almonds, hazels, walnuts, chestnuts, pistachio, the kernel pine, *Rubus*, *Ribes* and *Vaccinium*; and there is an endemic wild species of vine, *Vitis orientalis*. The Smyrna fig, the North Syrian pistachio and certain groups of the cherries, pears, plums and almonds are endemic. All these wild fruits and nuts are used by the inhabitants and often the inferior

ones are removed to leave room for the best specimens ; in this way they have come gradually into cultivation, and various degrees of the process are to be seen at the present time.

The peculiar characteristics of the flora of Anatolia are explained when it is realized that this is the only country where the continents of Asia, Africa and Europe meet. It is the meeting place of different types of allied plants, the oriental anthocyanin carrot and the wild carrot, the cultivated and wild vine, the large and small-seeded forms of many leguminous plants, hence intermediate forms or often new types altogether have resulted. The wide range of ecological conditions in the country and the low degree of purity of the crops have favoured the preservation of the greatest possible number of these new forms. Yet most field and vegetable crops are remarkably uniform as regards the character and quality of the seeds, evidence of a deliberate selection on the part of the agriculturists of the past. All these reasons have contributed to make Anatolia the source of many of the most valued varieties cultivated in Europe.

The volume under review terminates with a bibliography of 27 pages, an index of Turkish, Latin, Russian and geographical names and an extensive French summary. It is provided with an excellent map of the country and is unusually well printed and illustrated.

KOROVIN, E. P.

581.9(584)

(The flora of Central Asia and Southern Kazakstan).

Acad. Sci. U.S.S.R., Bot. Inst., Moscow and Tashkent 1934 : 10 roubles.

Pp. 480.

The present volume represents a further contribution to the series of works devoted to the flora of different sections of the Soviet Union. The flora of Central Asia has received comparatively little study in the past ; starting with a general review of the theoretical basis of ecology, the author proceeds to describe the ecological characteristics of the region as it exists at present and as it existed in the past, followed by a detailed description of the flora of the different zones, comprising desert of various types, steppe, meadows and bogs, forests, zones of xerophytic plants, mountain zones and oases. The chapter on the oases contains an account of the crops there cultivated, including a number of important new crops whose cultivation is just beginning. The volume is well and attractively presented and is illustrated ; it contains indexes to the Latin, Russian and local names of all the plants mentioned, in addition to a bibliography and a chart illustrating the zones of vegetation.

KUCKUCK, H.

633:576.16

633:575

Von der Wildpflanze zur Kulturpflanze. **(From wild plant to cultivated plant.)**

Alfred Metzner, Berlin, 1934 : RM. 2.80. Pp. 68. 16 illus.

"The importance of natural and artificial selection in the origin of new races of plants" is, as explained by the sub-title, the theme of this small book by Dr. Kuckuck. Written for the general reader, it avoids the more controversial questions of the origin of cultivated plants and confines itself to an outline of the process as we now know it. The early work of Vavilov and his co-workers on the origin and distribution of the cultivated plants is outlined in detail, though no mention whatever is made of the more recent contributions of these authors.

The general methods of plant breeding are then described and illustrated by an account of the breeding work carried out on the different groups of plants at the Kaiser Wilhelm Institut für Züchtungsforschung at Müncheberg, with which the author has been personally associated for so many years. The inclusion of a number of hitherto unpublished photographs of Dr. Schick's potato hybrids adds to the interest of the book.

SPRECHER VON BERNEGG, A.

633.73

633.79

Tropische und subtropische Weltwirtschaftspflanzen. III Teil. Genusspflanzen. Band II. Kaffee und Guaraná. (**Tropical and subtropical economic plants of the world. Part III. Stimulants. Vol. II. Coffee and Guaraná.**)

Ferdinand Enke, Stuttgart, 1934: Unbound RM. 21, bound RM. 23.

Pp. xi + 286. 51 illus.

A further volume of this admirable work has now appeared, arranged on lines similar to the previous volumes. Guaraná, *Paullinia Cupana* H.B.K., a stimulant and medicinal plant of the Amazon, occupies only the last ten pages, the rest of the volume being devoted to coffee. There is the same attractive historical treatment, with quotations from the classics, the same accurate description of the morphology of the genus and of the respective species and their varieties. Considerable attention is given to the nature of the true varieties, geographical races, hybrids and commercial varieties found within the species and to their distinguishing features. General biological and agricultural questions are then considered, a very brief passing reference being made to seed selection and breeding. A list of diseases, giving the common name of the ailment in German, English, French, Spanish and Portuguese, the name of the causal organism, its characteristics and methods of control covers 50 pages of text. The remainder of the book is occupied by consideration of industrial questions.

PAGLIANI, L.

633.8

Le piante aromatiche e da profumo. (**Aromatic plants and plants for perfume.**)

Nuova Enciclopedia Agraria Italiana, Unione Tipografico-Editrice Torinese 1933: Pt. 5: Pp. 225.

Intended as a companion volume to the author's work on medicinal plants, the present monograph gives a description of the aromatic plants and plants used in the making of perfumes growing wild or cultivated in Italy.

The plants are arranged in alphabetical order according to their common names and their English names (with unfortunately several orthographical and other slips) and also their Latin, French, German and Spanish names are given. There follows a brief botanical description of the plant and notes on its cultivation, uses and properties.

634.00.15(43)

635.00.15(43)

Führer durch den deutschen Gemüse- und Obstbau. (**Guide to German Horticulture.**)

Rud. Bechtold und Comp. Wiesbaden 1932: RM. 8. Pp. xii + 333.

A useful guide giving the names of all research stations and similar institutions in Germany, with addresses, name of director, publications issued and field of study. The names and addresses of the local authorities are included.

RUBNER, K.

634.9:581.9

Die pflanzengeographisch-ökologischen Grundlagen des Waldbaus. (**The phytogeographical and ecological basis of forestry.**)

J. Neumann, Neudamm 1934: 3. Auflage. Unbound RM. 34, bound RM. 36.

Pp. xiv + 597. 173 illus.

Since the development of the biological and experimental methods of study in phytogeography and plant sociology, plant populations have come to be recognized as dynamic systems composed of innumerable elements—species, varieties, races—in ever-changing equilibrium, the forces

controlling this equilibrium being the climatic and edaphic factors of the various geographical regions. These factors are described and discussed at great length in the first half of this new edition of Professor Rubner's work, which therefore serves as an admirable monograph on plant geography in general, though the examples naturally deal only with forest trees. The section on the edaphic factors is contributed by Dr. Wilhelm Graf. The second half deals directly with the elements of the population, starting with definitions of the various systematic units. The importance of race and genetical constitution is being appreciated to an ever greater degree in forestry and this aspect is fully discussed. The distribution of the different species in Europe is then treated, both historically and with respect to the present distribution of each species and its constituent forms. The fourth part is devoted to forest sociology proper. The volume is admirably illustrated and is provided with charts of the distribution of the main species.

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